To the Library of the Royal
College of Surgeons in England

HISTORY AND DESCRIPTION

OF THE

SKELETON

OF A

NEW SPERM WHALE,

LATELY SET UP IN

THE AUSTRALIAN MUSEUM

BY

WILLIAM S. WALL, CURATOR;

TOGETHER WITH SOME ACCOUNT OF A NEW GENUS OF SPERM WHALES CALLED

EUPHYSETES.

TWO PLATES.

Ἠ ἔτι ΜΟΙ καὶ κῆτος ἐπισσεύῃ μέγα δαίμων
Ἐξ ἁλὸς, οἷά τε πολλὰ τρέφει κλυτὸς Ἀμφιτρίτη.
ΟΔ. ε.

SYDNEY:
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NOTICE.

As it is very desirable that the Collection in the AUSTRALIAN MUSEUM of the Whales, Dolphins, and Dugongs of the Southern Hemisphere, should be made as complete as possible, the Officers of whaling vessels and persons residing on the sea coast are earnestly requested to give notice to the Curator, Mr. W. S. WALL, of all specimens that are procurable, or of which the bones may have been discovered on the beach. Loose bones even are valuable, and particularly skulls.

The Curator will also thankfully receive all Zoological or Geological specimens which the owners may feel disposed to present to the Museum. And the Museums of Great Britain and Foreign Countries may effect an exchange of duplicates, by addressing a letter on the subject to the Secretary of the Australian Museum, Sydney.

CONTENTS.

CHAPTER I.

ON THE CATODON AUSTRALIS.

WHATEVER friendship or familiarity whales and dolphins may, according to ancient writers, have had with men in the olden time, it is very certain that the human species, with the exception of a few sailors, have very little acquaintance with their "fat friends" in these days. Even whalers in general know little more of them than their oil. While a lion or a tiger has become quite a vulgar animal in our menageries, there are few persons who have seen a live cetacean in captivity, except Gesner, or rather Rondelet, (whom Gesner, in the passage alluded to, seems to be quoting,) who states, that in his day, his countrymen were in the habit of carrying live dolphins as far into the interior as Lyons! It may indeed, happen, that the veracity of old Conrad's book, is as little to be trusted to in this story,* as in its pictorial representations of the whale tribe. At least, in the present railroad times, when a live hippopotamus is sporting in the midst of London, the most of the external aspect of a cetacean that any Cockney has yet seen, has been presented to his wondering gaze by some distorted skin. And this is one of the reasons why the figures of the sperm whale given by Beale and Frederic Cuvier are so widely different from each other, as to make it almost incredible that they should have been intended for the same species. By such misshapen masses of stuffing so little accurate information is afforded to the zoologist, that he is of necessity obliged to have recourse to the skeleton.

But when he takes this step in search of knowledge, the naturalist finds the osteology of cetaceous animals to be a very difficult pursuit, not merely on account of the general

* Hist. Anim., 1558, lib. iv. p. 387.

unwieldiness of the skeletons, but of the time and trouble necessary to extract the oil with which their bones are saturated, and which makes the preparation of them, as I can vouch, most offensive to the senses. Perfect skeletons of the order of *Cetacea*, or more correctly *Cete*, are, therefore, in fact, very rare in museums. Of animals said to be cachalots or sperm whales, perhaps the most perfect skeleton hitherto described, is the one said by Beale to belong to Sir Clifford Constable, Bart., of Burton Constable, in Yorkshire. Its carcass was cast ashore on the coast of that county in 1825, and was described in the same year by Dr. Alderson, in a paper read before the Cambridge Philosophical Society.

Beale was the surgeon of a whaler, who having made some notes on the habits of the sperm whale of the Northern Pacific, determined on his return to England, in 1833, to give an account of its osteology. This, however, he appears to have studied for the first and only time, not in any of those numerous whales he had seen killed on the coast of Japan, but in Sir Clifford Constable's Yorkshire specimen, the skeleton of which had been set up apparently in a very creditable manner, by a Mr Wallis, of Hull, many years after the animal had been cast ashore. Now, this Yorkshire skeleton, we shall give good reasons for believing to be that of an animal different not merely from our Sydney sperm, but even from the true sperm whale of the coasts of Europe; nor is it likely to be the same as that of the sperm whale of Japan. Beale, was no doubt, led into his mistake by agreeing with most observers since the time of Cuvier, in considering Lacepède's three genera, *Catodon*, *Physalus*, and *Physeter*,* and the

* *Physeter* and *Physalus* are classical words to express the blowing of whales, and, therefore, are names applicable to all *Cetacea*. *Catodon* is a modern name invented by Artedi, and adopted by Linnæus, to express what is more peculiar to sperm whales, namely, their possession of teeth only in the under jaw. The French name cachalot, is, according to Cuvier, derived from the Basque word *cachau*, signifying *tooth*. It may be here observed, that the Basques had a right to name the animal, as they appear to have been the first professional fishermen of the sperm whale, the valuable products of which were comparatively unknown to the ancients.

several species said to belong to them, as all referable to one species, namely, the *Physeter macrocephalus* of Cuvier. But Cuvier himself was in doubt whether the cachalot of the Southern Pacific might not be specifically different from that of the Northern Atlantic. He says that it is for naturalists to judge whether the differences observed by him in the inferior jaw of an Antarctic cachalot, and the under jaw of a sperm whale cast ashore on the coast of France, result from a mere distinction in age or sex, or from a specific difference. And he says, further, that he does not imagine that naturalists will be able to decide this question until they shall have been in possession of a complete head of the Antarctic cachalot, to compare with that of the Northern Atlantic animal, or until they shall, at least, have been in possession of good drawings of the external figures of both these cetaceans. Mr. Gray, of the British Museum, in No. XIII. of the Zoology of the Antarctic Voyage of the Erebus and Terror, which was made under the command of Sir J. C. Ross,—a work that has more reference to the external appearance, than to the anatomy of whales—also says, in 1846, "I have no doubt, from the analogy of other whales, that when we shall have had the opportunity of accurately comparing the bones, and the various proportions of the parts of the northern and southern kinds of sperm, we shall find them distinct. Quoy gives an engraving of a drawing of a sperm whale which was given him by an English captain, and which is probably the southern whale. He calls it *Physeter polycyphus*, because its back appears to be broken into a series of humps, and Desmoulins re-names it *Physeter Australis*." Mr. Gray, moreover, makes a family of "the toothed whales," under the name of *Catodontidæ*, and to this family he assigns three genera, viz., *Catodon*, *Kogia*, and *Physeter*—their types being, respectively, the *Catodon macrocephalus*, or sperm whale of the Northern Atlantic; the *Kogia breviceps*, or short-headed sperm whale of the Cape of Good Hope; and the *Physeter Tursio*, or Black-fish of the North Sea. Now the larger skeleton lately set up by me in the

Sydney Museum clearly belongs to a species of the genus *Catodon;* and the problem to be solved is, whether it be identical or not, as a species, with the *Catodon macrocephalus* abovementioned, which is an European whale. Of this species, *C. macrocephalus*, the British Museum only possesses one upper jaw, and three under jaws. In the London College of Surgeons, there is, according to Gray, the head of a fœtus ; and at Paris there is a nearly perfect skeleton ;—with this last, therefore, I would more particularly compare our Sydney skeleton, which has the great advantage of being also perfect, and the history of which is as follows :—

It was announced in the *Sydney Herald* of the 5th December, 1849, that the carcass of a sperm whale had been found at sea and had been towed by the schooner Thistle into the harbour of Port Jackson. As the curator of the Australian Museum, I considered that the skeleton would form a valuable addition to our collection ; so with the permission of the Museum Committee, I lost no time in proceeding to Neutral Bay, where the schooner then was at anchor, having a male whale alongside. Mr. Williamson, the master of the vessel, as soon as he was made acquainted with the object of my visit, offered me most liberally the entire skeleton, with the exception of the under jaw, which he was desirous of retaining for the sake of the teeth. On my representing, however, to him the advantage of our possessing a complete skeleton, he eventually consented to my taking away the whole of the bones. The blubber portions of the carcass had, on account of the oil, been removed previously to my arrival on the spot, but as soon as I was in possession of all that remained I proceeded to adopt proper measures for cleaning the bones. After considerable difficulty in finding persons willing to encounter so unpleasant, and as they imagined, so unhealthy, a task—I at last succeeded in engaging four Portuguese sailors, who had been some years employed in the whale fishery. It was, however, then discovered that a portion of the tail, containing ten of the caudal vertebræ, and also that a fin, were deficient. The tail

had been sent to Sydney with the blubber; but as I soon found it on Hughes' Wharf, in Sussex-street, I then, by permission of Colonel Baddeley, of the Royal Engineers, carried the whole of the bones in my possession to Pinchgut Island, where, under a course of lime and other preparations, at the end of two months they were thoroughly bleached and freed from oil and all offensive odour. As to the lost fin, every hope of recovering it had been abandoned, when I was informed by two boys that a strange fish was lying on a rock near the bath, in Wooloomooloo Bay. This, fortunately, turned out to be the part missing, which, by the way, was by far the most interesting of the two fins, as it was the right one, the bones of which are considerably larger than those of the left, and also more perfect. The fin had been removed from the whale by the crew of a coasting vessel, while they were wind-bound in Wooloomooloo Bay. Their object was to render it down into oil; but a fair wind springing up before they had time to effect their purpose, they cut it adrift, when it probably floated to the place where the boys so fortunately discovered it.

I state these facts in order to show the obstacles which I had to encounter before I was enabled to obtain so perfect an assemblage of the bones. Those finally deficient turned out to be merely the bones of the pelvis, which were most likely to escape our notice, from not being articulated to any of the other bones, but only suspended in the flesh of the belly. Shortly, however, after the skeleton had been set up, I heard of another sperm whale having been killed off the Heads of Botany Bay, and that it had been washed ashore on the sandy beach that extends between that Bay and Port Hacking. I was resolved to complete my collection of the bones, but experienced considerable difficulty in discovering the carcass of this last whale, as it was nearly buried in the sand. It proved to be that of a female, a little larger than the other. With some danger from the heavy surf which broke over it I contrived to secure the two pelvic bones of the right side and also the atlas and axis, with a complete

sternum. Our materials for description became thus so far complete.

The skeleton of the first of these two whales, which, as said before, was a male, has been erected on strong iron supports, and the cartilaginous substance into which the bones of *Cetacea* so readily pass, and which occurs so plentifully between the vertebræ, has been carefully replaced by gutta percha substitutes, after drawings taken carefully by me on the spot where the carcass was cut up.

The whole length of skeleton as set up is thirty-three feet six inches, from which if three feet one and a-quarter inches be subtracted for the length of the intervertebral cartilages, there will remain a total length of bone in the skeleton of thirty feet four and three-quarter inches. The whole length of the head from snout to occiput is nine feet six inches. In the "*Ossemens Fossiles*" Cuvier has not given us an exact comparison between the whole length of skeleton and the length of the head in the sperm whales he examined, because neither of his skeletons were quite entire. His most perfect skeleton was the one purchased by him in London, and which must be considered as typically to belong to the true sperm whale, or his *Physeter macrocephalus*. Now all that he says of the whole length of this is, that it was about fifty-four feet long, "to which two or three feet more may be added for the intervertebral cartilages." Beale does not state whether the Yorkshire skeleton is set up with any allowance or substitute for the size of the intervertebral cartilages, or whether it consists of the bones alone, but he states the extreme length from snout to tail to be forty-nine feet seven inches. However, I am inclined to believe that this is the joint length of the bony vertebræ alone, because he states that the animal was measured shortly after death by Dr. Alderson, and found to be fifty-eight feet six inches; and nine feet seems to be too great a difference between the length of the living animal and its skeleton, unless we are to make allowance for the length of the intervertebral cartilages. Assuming this, I offer the following table as showing the comparative measurements of those three skeletons.

	Length of head.		Total length of skeleton without cartilages.	
	Feet	Inches	Feet	Inches
Cuvier's London Skeleton	16	4	54	0
Beale's Yorkshire Skeleton	18	0½	49	7
Wall's Sydney Skeleton	9	6	30	4¾

Thus we see at once that while Cuvier's London skeleton and the Sydney one come wonderfully close to each other in the proportions of the head to the whole length; the Yorkshire skeleton having a head so large in proportion to the length, must belong to a different species. If the forty-nine feet seven inches include the length of the intervertebral cartilages, the disparity will be still greater. As it is, according to the Yorkshire proportions, the Sydney skeleton, which is thirty feet four and three-quarter inches long, ought to have a head upwards of eleven feet long. Instead of which, this skull is only nine and a-half feet long; so that the head in our sperm whale is consequently shorter in proportion to the body than Beale's whale. It is the same in Cuvier's London whale; yet the figure of the sperm whale, as given by Frederic Cuvier, and which appears to be that of the sperm whale of his brother and of the Northern Atlantic Ocean, differs from the figure of the Pacific sperm whale given by Beale, in having a larger head; so that the Yorkshire skeleton could not possibly have belonged to the same whale as that of which Beale made a drawing in the Pacific. It is true that Beale and others consider the difference to result from a defect in F. Cuvier's figure, but I think reasons have been now adduced for our believing that the drawings have been taken from two different species. Of this, indeed, I shall advance further proof hereafter.

The principal materials which Cuvier possessed for laying the foundation of all our knowledge of the osteology of the sperm whale, were the head of an animal cast ashore at

Audierne, in France, in 1784, and the almost perfect skeleton mentioned before as having been purchased by himself in London, in 1818. Now he has given us a table of the dimensions of the several parts of the head in these two specimens. Reducing it to English measure, I shall make use of this table by placing his observations in parallel columns to the corresponding dimensions of the Sydney whale. It will thus be seen that while Cuvier's two whales do not considerably differ among themselves in the relative proportion of the parts of the head, there is a wide discrepancy in the proportion which the parts of the head in the Sydney cachalot bear to each other. It is on viewing such a table that we regret the want of accurate drawings by which we might compare the external forms of these three animals in other ways than by mere measurement of their bones. I have, in the table, also placed some measurements of the head of Sir Clifford Constable's Yorkshire skeleton, and of a skull of Gray's *Catodon macrocephalus* which is in the British Museum. They are all the dimensions of these last two which have as yet been rocorded.

PRINCIPAL DIMENSIONS OF CERTAIN HEADS OF SPERM WHALES.

	Cuvier's London Skeleton.	Cuvier's Audierne Skeleton.	Beale's Yorkshire Skeleton.	Sydney Skeleton.	British Museum Skull.
	INCHES.	INCHES.	INCHES.	INCHES.	INCHES.
1. Whole length of head, from tip of snout to the posterior edge of the occipital condyles	196·9	185·1	216 5	114	179
2. Whole length of skull, from the posterior edge of occipital condyles to the hinder edge of the right blower	21	19 7	....	17	....
3. Whole length of snout, from tip to the bottom of the ante-orbital notch of the maxillary	139	135·5	. .	80	127
4. Width of head between the orbits	94·5	81·1	100	60	..
5. Width of snout between the ante-orbital notches of the maxillary	64·2	57·8	....	43	57
6. Distance between the suborbitary foramina	42·5	42·5	....	28	....
7. Distance between the anterior points of the maxillaries	11·8	11·8	....	6·5	...
8. Breadth of the left nostril or blower	7·8	6·3	....	6	....
9. Breadth of the right nostril	3·1	2·7		3	....
10. Distance between the outer edges of the occipital condyles	22	21·6	25·5	19	....
11. Greatest width of the lower part of the occipital foramen	80·3	63	..	60	...
12. Height of occipital, from the inferior edge of the basilar to the summit of the crest	65·7	64·2	66·5	44	....
13. Length of the under jaw, in a straight line	182	161	202	92	....
14. Length of the symphysis of under jaw	110	94	125	48	....
15. Length of the series of dentary alveoles in under jaw	127·6	109 5	....	56	....
16. Distance between the outer edges of the articular condyles	65·7	66·5	...	53 5	....
17. Height of the mounting branches of under jaw	22·8	19 7	....	16	...
18. Breadth of under jaw, at the place where the symphysis begins	14	11·8		9	...

Now the head of Cuvier's London skeleton was very nearly a foot longer than that of the Audierne one; and with the exception of the width of the occipital foramen in the two animals, which we find to be rather larger in the Audierne specimen, we observe the above relation in size to be well kept up throughout the dimensions of the respective parts of the head. So well kept up, indeed, as to incline us to adopt the idea that these two animals of the Paris Museum must have belonged to the same species. In Cuvier's London and Audierne skulls, as also in the heads deposited in the British and Sydney Museums, the whole length of the head is to the length of the snout always in the same proportion, viz., as 13 to 9. Nevertheless, the Sydney skull differs in a very important point; for while the British Museum upper jaw appears to belong to the same species as the two Paris skulls, not only on account of the above proportion, but also on account of the width of the snout at the ante-orbital notches in all three being always less than one-third of the whole length, this width in the Sydney skull is considerably more than one-third of the whole length. Again, the width of the head between the orbits in the Yorkshire skeleton, Cuvier's London, and the Audierne skulls, is always less than one-half the length of the head. In the Sydney skull it is considerably more. In Cuvier's London, and the Audierne skulls, the height of the occipital part of the skull is nearly equal to one-third of the whole length. In the Yorkshire skeleton, according to Beale, it is considerably less; and in the Sydney skull considerably more;—so that, in general, the Sydney skeleton is further removed from the Yorkshire skeleton than from the three others. And if these last three be considered to belong to one species, viz., the *Catodon macrocephalus* of Gray, or Northern Atlantic sperm whale, we may infer that the Sydney skeleton belongs to another species of the same genus, which, whether identical or not with Quoy's *Physeter polycyphus*, that is, Desmoulins' *P. Australis*, is certainly nearer in structure to the true Atlantic sperm than to the Yorkshire skeleton. The Sydney

whale is assuredly not the *Kogia breviceps* of Gray, for this Cape of Good Hope whale is said to have the beak only as long as its width at the notches. Neither is the Sydney whale a species belonging to Gray's genus *Physeter;* for this last has its blow hole opening on the middle of the top of the head, instead of opening at the upper termination of the snout, as in true sperm whales.

Beale's Yorkshire skeleton has, as before mentioned, a skull eighteen feet and half an inch long, while the extreme width of it was measured by him to be eight feet four inches. Now, according to this proportion, the Sydney skull, nine feet six inches long, ought to have a breadth of only four feet four and a-half inches, whereas its actual breadth is five feet four inches. In other words, in the Sydney animal, the head is nearly one-fifth its whole width broader than the Yorkshire cachalot, which at the same time, as was before shown, has proportionally a longer head. As might have been expected from the foregoing remarks, the Sydney skeleton has a proportionally shorter under jaw; for comparing the length of the Yorkshire skull with that of its under jaw, we find that the Sydney under jaw, ought, in like manner, to be eight feet ten inches long, whereas, it is only seven feet eight inches.

In all the *Catodontidæ*, or family of sperm whales, there is an early junction of the two sides of the under jaw; so that from the articulating portion of the base of the skull, the two branches converge in nearly straight lines to a point where this junction takes place, and then both extend anteriorly, in the form of a subcylindrical symphysis. This structure is not common in *Cetacea*, but may be seen in the Soosoo, or Dolphin of the Ganges, the genus *Platanista* of Cuvier, who, therefore, ascribes to such fresh water dolphins a certain affinity with sperm whales. Perhaps, however, this relation ought more correctly to be termed, an analogy.

In the very learned introduction to Cuvier's Comparative Anatomy of the Sperm Whale, we find that Sir R. Sibbald, in 1689, described a specimen cast ashore on the coast of Scotland, as having forty-two teeth. In 1723, Theodore Hasæus

described one caught, latitude seventy-seven degrees north, as having fifty-two teeth. Anderson, in 1746, described one with fifty teeth; and two others afterwards with forty-two and fifty-one respeetively. In 1770, Robertson dcseribed one cast ashore at Leith, with forty-six teeth. But such early naturalists were not very aecurate observers of specifie distinetions, and it is even supposed that more than one of them may have taken other *Cetacea*, particularly the genus *Hyperoodon*, for true *Catodontidæ*, or sperm whales. However this may have been, Beale positively describes the Yorkshire sperm whale as having in the lower jaw forty-eight teeth, twenty-four on eaeh side. Cuvier does not mention the number he found in his Audierne speeimen, but on examining his figures we see that a supposed young eaehalot, of whieh the under jaw is preserved in the Parisian Cabinet d'Anatomie Compárée, has twenty on eaeh side. Cuvier himself, however, is inelined to think that this last jaw may have belonged to an adult animal distinct from the sperm whale, and he says that his London specimen of true caehalot—his typical *Physeter macrocephalus*—has fifty-four teeth in the under jaw. Our Sydney specimen has only forty-two teeth, so that although we may, with the celebrated John Hunter, imagine it very possible that sperm whales, according to age and other circumstances, vary in the number of their teeth, we need not preelude ourselves from supposing that these remarkable differences may also in some degree have their origin in the species being distinct.

The Sydney Museum is in possession of two other under jaws of Pacific Ocean sperm whales, besides the one appertaining to the complete skeleton under examination. One of these is fifteen feet long, and to be in proportion with our whale, must have belonged to a skeleton sixty feet long, or more, without the intervertebral cartilages. This under jaw, as far as its dilapidated state will allow us to ascertain, had only forty-two teeth, and must, by the following proportions, have belonged to a speeies distinet both from Cuvier's London and from the Yorkshire whales. The other under jaw has

also forty-two teeth, and is thirteen feet two inches long. I subjoin a table of the proportions of these three under jaws assumed to belong to the same species, that is, *Catodon Australis.*

	Sydney Skeleton.		Under jaw from Twofold Bay, presented by B. Boyd, Esq		Under jaw presented by G. Blaxland, Esq.	
	Ft.	In.	Ft.	In.	Ft.	In.
Length of lower jaw in straight line	7	8	13	2	15	0
Length of symphysis	4	0	7	11	9	6
Length of series of dentary alveoles	4	8	8	9	10	6
Distance between outer edges of the articular condyles	4	5½	6	0	6	5
Height of the mounting branches of the lower jaw	1	4	2	3	2	3
Width of jaw where the symphysis begins	0	9	1	3	1	4
Number of teeth	42		42		42 or more	

According to Mr. Gray, who probably, with Beale, took John Hunter as his authority for the assertion, not only the number of teeth varies according to age, but the length of the lower jaw appears to increase in front, so that in the older specimens the symphysis is more, and in the younger ones less than one-half of the entire length of the under jaw. In our three Sydney under jaws there can be no doubt that the disproportion between the length of the symphysis and half length of the entire jaw goes on increasing according to the size of the animal; but all three have their symphysis longer than half the length of the under jaw. It is also certain that the inspection of the greatest under jaw in the Sydney Museum, may induce one to think it possible that, as Mr. Gray says, the symphysis increases with age in a greater proportion than the whole length of the lower jaw. By the way, I may remark, that this largest specimen also appears to exhibit more than forty-two dentary alveoles or sockets. We thus have John Hunter's position illustrated, that "*the exact*

number of teeth in any species of sperm whale is uncertain ;" since as the posterior part of the jaw becomes longer with age, the number of teeth in that part increases, and the sockets become shallower and shallower, until, in the end, there is only a slight depression to mark their place.

Cuvier and others have thought that they could discover in their specimens of the upper jaw, a series of alveoles intended for the reception of the conical teeth of the under jaw. Indeed, Dr. Alderson expressly mentions the existence of such cavities in the upper jaw of Sir C. Constable's whale. Beale, however, on his examination of the skeleton of this very same whale, came afterwards to the conclusion that there were no indications of sockets in the upper jaw. I imagine, therefore, that as Dr. Alderson was describing from the specimen when it was first cast ashore, the cavities of the upper jaw, into which he says, "the teeth of the lower jaw fitted when the mouth was closed," must have merely been cavities in the fleshy lining of the palate. We shall see that such cavities really exist in a new kind of sperm whale hereafter to be described. I have also carefully examined this matter in the skeleton now before us; and, as irregular and linear cavities may be discovered in the roof of the mouth, impressed along the roof of each maxillary in a line nearly parallel to its junction with the inter-maxillary, I have come to the conclusion that these cavities, although not exactly corresponding in situation or form to the teeth of the under jaw, may yet possibly mark the place of the bottoms of those sockets in the gums, with which all observers of the sperm whale in a fresh state, say the upper jaw is furnished for the purpose of receiving the teeth of the under jaw.

The accounts given by old writers, of the voracity and fierceness of sperm whales, are completely contradicted by late observers, who have recorded that these vast animals are timid and inoffensive, as, indeed, might have been imagined from their having no teeth in the upper jaw. Beale asserts, and it is a fact in which we may have the greater confidence, from its having been ascertained by personal observation,

that the sperm whale of the Pacific feeds almost entirely on cephalopod *mollusca*, or *squid*; and, that when near land, it sometimes, though very rarely, devours small fishes.

Books of Natural History, in general, make the grand characteristic of sperm whales to consist in the utter deficiency of teeth in the upper jaw.* It may be some excuse for this common mistake, that we find the deficiency of upper teeth mentioned by Cuvier in his "*Regne Animal*," as, perhaps, the most palpable distinction. In truth, however, scarcely any character of sperm whales can be selected less peculiar than this, since the want of teeth in the upper jaw is very common among the dolphins. The genera *Hyperoodon*, Lacep., *Ziphius*, Cuvier, and *Delphinorhynchus*, Gray, have all no teeth in the upper jaw; and even such typical genera of *Delphinidæ* as *Beluga*, Gray, *Globicephalus*, Lesson, and *Grampus*, Gray, have them early deciduous. So far, therefore, as concerns this character, the cachalots are nothing else than immense animals of the dolphin family.

At least, there can be little doubt of the *Catodontidæ* or sperm whales coming nearer to the dolphins, more particularly to the genus *Hyperoodon*, in structure, than to the toothless or true whales, forming Mr. Gray's family *Balænidæ*. One great distinction from all other *Cetacea* of the *Catodontidæ*, is the vast concavity of the upper surface of their skull. Several kinds of dolphin have the skull concave, but none have the hollow of such capaciousness. This hollow, under the floor

* Beale says, that some sperm whales have rudimentary teeth in the upper jaw; but if so, such animals must belong to a very different species from our Sydney whale, which has not even the vestige of alveoles. Nor has the skull of a very young sperm lately discovered on the beach near Botany. However, it is right to remind those persons who may have it in their power to investigate the matter, that Mr. F. D. Bennett says, that he found eight rudimentary teeth on each side of the upper jaw in two instances of sperm whales, which teeth "are not visible externally in the young cachalots, but may be seen upon the removal of the soft parts from the interior of the jaw." The entire length of these teeth was about three inches! Now, this story is not to be reconciled with the description of the upper jaw of the sperm whale given above, and, therefore, I suspect that Mr. Bennett must have taken some kind of dolphin for a young cachalot.

of which the brain is lodged, is formed by an extension of the maxillaries, which are so developed, as, together with other bones, to form a semicircular wall, which in the Sydney skeleton has less of the horseshoe shape than the head figured by Cuvier, in his " *Ossemens Fossiles.*"

The immense snout of our Sydney whale, like that of the dolphins, is formed of the vomer on the middle line, with the intermaxillaries on each side; and again having the maxillaries on the outside of all. The vomer is thicker at the base in the Sydney whale than in the one figured by Cuvier, and moreover is best distinguished in the middle line of the roof of the mouth. The extension of the intermaxillaries beyond the maxillaries forms the point of the snout. The nostrils are pierced in the middle of the semicircular cavity mentioned above, at the root of the vomer, and between the bases of the two intermaxillaries. The nostril on the right side is scarcely one-fifth of the width of the left nostril. The direction of both is oblique, and also their position with reference to the line of the vomer. The base of each intermaxillary rises with a curvature on each side of the nostrils, so as to form part of the bottom of that vast semicircular cavity on the back of the head, where is the principal deposit of spermaceti. But the intermaxillary of the right side reaches considerably further back than the left intermaxillary. Indeed, a want of symmetry in the *Catodontidæ* generally, is singularly conspicuous; and in our whale, an organ on one side scarcely ever agrees in size with its corresponding organ on the other side. The left eye, for instance, as Cuvier says, is smaller than the right one;—indeed, so small, as in Cuvier's specimen, to have almost escaped his observation. He says, moreover, that fishermen are well aware of the advantage they possess in attacking a sperm whale on its blind side. In like manner, on my first inspection of the carcass in Neutral Bay, I could not discover the left eye in our Sydney whale. This disappearance of the left eye would appear to result from the extreme development of the left nostril, for

the purpose of forming the blow-hole from which the animal spouts.†

I have before said that at the back of the head or occiput, there rises a sort of semicircular wall, almost perpendicularly. This is formed by the right bone of the nose, the base of the

† There is every reason to believe that the Scotch whale, described by Sir R. Sibbald, with forty-two teeth in the under jaw, was the Black fish, or *Physeter Tursio* of Linnæus, and it is also, perhaps, although I confess I have great doubts, the species of which Beale saw the skeleton in the possession of Sir Clifford Constable, in Yorkshire. Unfortunately, I am not able to refer to Dr. Alderson's paper. According to Sibbald, in the Black fish, a little above the middle of the rostrum, "there is a lobe which is called the *lune*, having two entrances covered with one operculum, called the *flap*." Now, from the relation which the position of the nostrils in the skull bears to that of their single external opening, or *blow-hole*, at the front of the snout in the genus *Catodon*, we may infer that a blow-hole placed nearer the middle of the head, as in the Black fish, would not so much distort the general appearance of the head. And here, by the way, I may observe, that the words "spiracle" and "blow-hole" appear to be better names than "spouter" for that external orifice by which the canal from the nostrils opens to the atmosphere; particularly if Beale be correct, who asserts that these animals never eject water from their nostrils, but only vapour. No better external characteristic of the true sperm whales, or genus *Catodon*, has yet been given than the position of their single blow-hole at the summit of their snout—the "fistula in rostro" of the old naturalists. It is as good a character as their fat quadrangular snout itself. And were it not that the Black fish, or genus *Physeter*, is said to have the blow-hole at the middle of the snout, as another cetacean of the same family, hereafter to be described, most certainly has likewise, all the *Catodontidæ*, or family of sperm whales, might thus be neatly separated from dolphins. The genus *Catodon* agrees with the herbivorous *Cetacea* alone, in having the nostrils opening at the extremity of the snout. It is not the object of the present work to enter particularly upon the external appearance of sperm whales, or upon the anatomy of their soft parts. Indeed, as yet, I have had few opportunities of studying such subjects. I may remark, however, that nothing is certainly known of the mode in which the single spiracle of the sperm whales communicates with the two nostrils in the skull. John Hunter would seem to assert, that there is only a single tube or canal from the commencement, for both nostrils. In some dolphins, on the other hand, there is said to be a dividing membranous septum. But all this subject requires further investigation; the only thing which appears certain, being, that their single external spiracle proves the *Catodontidæ* to be rather dolphins than true whales, which last have two distinct external spiracles, communicating by separate canals with the holes in the skull.

right intermaxillary, and the base of the two maxillaries doubled by the occipital. The maxillary forms the anterior angle of the orbit, in front of which it has a deep emargination or notch, and close to this notch, on each side of the head, is a deep hole, which must be considered as answering to the sub-orbital foramen in other animals; although, as Cuvier says, it is in these *Cetacea,* more correctly speaking, *super-orbital.*

The posterior angle of the orbit is occcupied by the point of the zygomatic apophyse of the temporal; but this does not quite join the post-orbital apophyse of the frontal, so that the orbit is, as it were, open at this place.

The inferior rim of the orbit is formed by a thick and cylindrical jugal, of which the fore part is dilated into an oblong plate, which partly closes the orbit in front.

The fossa temporalis is rather deep, of a roundish form, but not distinguished by any crest from the rest of the occiput. The zygomatic part of the temporal is shaped like a thick and short cone. Reaching to the orbit it alone forms the zygomatic arch, as in the dolphins. The occipital bone is vertical, and forms all the posterior face of that semicircular wall which is so singular a characteristic of the back of the head. The lower edge of this occipital bone is divided on each side by a notch into two lobes, of which the external one represents the mastoid apophyse.

OF THE OS HYOIDES.

When the intestines and other soft portions of the animal were about to be towed to sea, and cast adrift, I desired the men carefully to explore the masses of flesh; the result was fortunate, for they had not made use of their spades many minutes before they struck against some hard substances in one mass, which, on examination proved to be the parts of the *os hyoides.* This organ, in cetaceous animals, is generally

composed of three bones—two lateral, which are the styloideans; and a central one, which is the true *os hyoides*, and which is often separable into three. The styloideans, or styloid processes, are attached by a cartilage to that lobe of the occipital which represents the mastoid process. The *os hyoides* itself has somewhat of a crescent form, having at the convex and anterior part two apophyses by which it is suspended by cartilages to the styloideans. On each side, more particularly in young specimens, the two horns of the crescent are separated by a suture from the centre piece. In our Sydney whale, which is comparatively a young specimen, the central bone of the *os hyoides* is heart-shaped, with the point of the heart notched, so as to give off the two short apophyses to which the styloideans are attached by cartilage. It is also keeled in the middle behind, and concave within. On each side we see a flat oval bone, joined by a suture to this middle bone. In some *Cetacea*, these bones, which form the horns of the crescent, are said always to remain in the state of cartilage. The styloideans, in our whale, are insulated slender prismatic bones, somewhat rounded at the points. Cuvier has figured an *os hyoides* (O.F. pl. 226. fig. 15,) very like to the one just described, and which he supposes to have belonged to the Audierne Cachalot. The dimensions of the *os hyoides*, in our specimen, are as follows :—

	Feet.	Inches.
Middle length of middle piece	0	11
Greatest breadth of ditto	1	5
Breadth of ditto between the horns	0	11
Length of a horn of the crescent	1	4
Greatest breadth of ditto	0	8
Length of a styloidean	1	7
Greatest diameter of ditto	1	0

OF THE EAR.

Camper has figured the bone of the ear in the Northern Sperm Whale, but I have not been able to refer to his figure, and to compare it with the ear of our animal. Cuvier never saw this bone of the sperm whale. In the Sydney specimen, the external aperture of the *meatus auditorius* is so small as only to admit of the entrance of a small quill. We may suppose that the sense of hearing need not be very acute, if Beale be right in contradicting the assertions of the old writers on this subject, and denying to these animals the power of making "any nasal or vocal sound whatever." Nevertheless, the general opinion of whalers seems to be that the *Cetacea* hear well, both in water and the open air; and comparative anatomists, such as Professor Rymer Jones, imagine that, while aquatic sounds are received into the ear under water by the external *meatus*, which, as above mentioned, is reduced here to the smallest possible diameter—atmospheric sounds, on the contrary, are perceived by the whale when his snout is out of the water, by means of the blow hole, which always communicates with the ear by a very wide Eustachian tube. One of the well known characteristics of *Cetacea* as an order, is to have the petrous portion of the temporal bone, wherein is lodged the organ of hearing, more or less distinct from the rest of the skull. In our whale the small bones of the ear are consolidated into one irregular stony mass, which is suspended by ligaments in a cavity formed between the temporal, occipital, basilar, and sphenoid bones. It is an ear different from that of herbivorous *Cetacea*, and also from that of true whales; but, as Cuvier judged from Camper's figure, remarkably close in its structure to that of the dolphin family. It may be divided into two parts, the drum and the labyrinth, which are separated from each other behind by a very deep longitudinal hole. The labyrinth is a stony mass, which may be divided into two portions,—1st, the larger one comprising the so-called semi-circular canals; and 2nd, the

hemispherical smaller one, which is separated from the larger portion nearly as distinctly as in dolphins, and contains the cochlea. Three of the four deep holes which separate these two portions of the labyrinth, are pierced at the bottom of the trefoil-shaped large one. They serve for the admission of nerves. The tympanum or drum is formed by a thick bony shell, curved inwards longitudinally, so as to resemble the whorl of an univalve mollusc; and to form thus a wide canal where the Eustachian tube takes its origin. Behind, this canal is closed, and assumes a somewhat bilobed form at the place where it becomes confluent with the posterior part of the labyrinth, by means of a rugose bony apophyse, to which the suspending cartilage is attached.

OF THE SPINAL COLUMN.

The spinal column in our specimen consists altogether of forty-four vertebræ, *i. e.*, if we consider the cervical vertebræ to be only two. But these in fact are seven, the first or atlas being free, and the other six* much compressed, being anchylosed together, as is manifested by their distinct ridges, which Cuvier long since pointed out in his London Skeleton, Oss. Foss. pl. 22, fig. 13.

The dorsal vertebræ, or those to which the ribs are attached, are ten in number, having the vertical spinous processes inclined backwards, and increasing in length from the first to the last. They have also short transverse pro-

* In the genus *Hyperoodon* and most of the *Delphinidæ* all the seven cervical vertebræ are soldered together, which occurs likewise in the true whales. But in the bottlenosed dolphin, as well as the dolphin of the Ganges, (*Platanista Gangetica* of Cuvier), it is stated by Cuvier that all the cervical vertebræ are free! What is singular is, that in the Rorquals, at least in the Cape Rorqual, the only cervical vertebræ soldered together are the axis and its following one; all the rest being quite free. In the order of *Cetacea* it is to be observed that the cervical vertebræ vary much in structure. For instance, Daubenton and Cuvier both state that the manati has only six such vertebræ.

cesses on each side, and the spinous process has an anterior articular, which being bifid, serves for locking one vertebra into the other, by receiving the inclined edge of the vertical apophyse of the preceding vertebra into its bifurcation.

The next eight or lumbar vertebræ, have their spinous processes wider at the summit than at the base. These are also more oblique and elongated than in the dorsal vertebræ, and their articulars rise gradually on their front edge, as in the dolphin tribe. These spinous apophyses at first increase to the centre of the lumbar vertebræ, and then begin to decrease in size.

The transverse apophyses of the vertebræ are at first merely simple tubercles of the articular processes, and they do not assume the form of distinct apophyses until the three or four last dorsal vertebræ. They then increase in size, until the two or three last lumbars, when they continue diminishing to the tail.

The under side of all the vertebræ after the fourth lumbar is strongly carinated.

The caudal vertebræ are twenty-four in number, and may be divided into two sets. The first thirteen have upright spinous processes, gradually diminishing in size, and disappearing with the lateral transverse apophyses. These thirteen vertebræ have attached to them twelve long inferior bifid processes,* called V bones, each nearly perpendicular to the vertebral axis, and articulated, or at least, connected by strong cartilage with the bodies of two consecutive vertebræ. The third of these V bones is the longest, being one foot four inches long; but the first and last are only four inches each. While the fore part of the spine, is as above described, made strong by having the consecutive dorsal vertebræ locked into each other, so that the hinder part of the vertical apophyse of one is received,

* The first of these V bones is truly bifid in our Botany whale, and the arms are of unequal length, but in the Sydney whale this V bone is not bifid, but only a subconical process. Is this a difference of sex or of species? Or, are our two animals varieties of one species?

as it were, into the anterior bifurcation of the same apophyse in the following vertebra; the root of the tail, which requires more flexibility and power of motion from side to side, has equal strength given to it by the manner in which every two consecutive vertebræ of the first thirteen caudals are bound by tough cartilage to the twelve connecting V bones.* The twenty-seventh and three following vertebræ have their transverse apophyses perforated at the sides for the passage of tendons which appear to have the same object of uniting strength with perfect mobility of this part of the spine.

The last eleven of the caudal vertebræ are without processes of any kind, and rapidly diminish in size down to the terminal bone of tail, which is nearly globular, and scarcely one inch in diameter.

Now taking the two most perfect sperm skeletons hitherto described, namely, Cuvier's London, and Beale's Yorkshire, we find that the last has forty-four vertebræ, like our Sydney specimen; but that the first has fifty-five vertebræ, accounting the six last cervical vertebræ to be anchylosed into one. The following table will show the differences more clearly.

	Cervical Vertebræ as anchylosed.	Dorsal Vertebræ; or such as have a pair of ribs articulated to each.	Lumbar, or such vertebræ as intervene between dorsal and first having a V bone.	Caudal.	Total.
Wall's Sydney...	2	10	8	24	44
Beale's Yorkshire	2	10	8?	24?	44
Cuvier's London.	2	14	20?	19?	55

If Cuvier's London skeleton really has the number of vertebræ he assigns to it,† the animal must have been thoroughly

* Beale's Yorkshire skeleton has, according to him, only ten V bones, another proof of the species being distinct. Besides, the second V bone is the longest in his whale, whereas the third in our specimen is much the longest.

† There is no doubt that the number of vertebræ in different species of *Cetacea* varies much. Right whales and Rorquals generally have more than fifty, and in fact forty-four is upon the whole a small number of vertebræ for a cetacean animal.

distinct, not merely from the Yorkshire whale, but from our Sydney whale also; which last, however, in this respect agrees remarkably with the one described by Beale, so far at least as we can make out from that author's description. In all three whales I believe the foramen for the passage of the spinal cord to be widest as it passes through the atlas and other cervical vertebræ, from which it tapers away until it terminates about the commencement of the caudal vertebræ.

TABLE

SHOWING THE LENGTH AND CIRCUMFERENCE OF EACH VERTEBRA IN THE SPINAL COLUMN OF THE SYDNEY SPERM WHALE.

No.	Name.	Length.	Circumference.		No.	Name.	Length.	Circumference.	
		In.	Ft.	In.			In.	Ft.	In.
1	Atlas	3	5	11	22	Caudal 2nd having inferior processes	9½	5	7
2	Axis (which is called dentata in man) and five others anchylosed into one.	7½	5	8	23	3rd	9	5	6
3	Dorsal 1st	3	4	9	24	4th	9	5	0
4	2nd	4¼	4	9	25	5th	9	4	9
5	3rd	4½	4	8	26	6th	9	4	4
6	4th	4¾	4	6	27	7th	8¾	3	10
7	5th	5	4	7	28	8th	8½	3	3½
8	6th	5½	4	7	29	9th	8	3	1
9	7th	6	4	8	30	10th	7½	2	10
10	8th	6¼	4	8	31	11th	6½	2	8
11	9th	6½	4	9	32	12th	5½	2	6
12	10th	6¾	5	4	33	13th	4	2	2
13	Lumbar 1st	7	6	0	34	Caudal 1st without any inferior process	3½	1	10
14	2nd	7¼	6	1	35	2nd	2¾	1	8¼
15	3rd	7½	6	3	36	3rd	2¼	1	7¼
16	4th	8	6	5	37	4th	2	1	5½
17	5th	8¼	6	3½	38	5th	2	1	4
18	6th	8½	6	3½	39	6th	2	1	1½
19	7th	8¾	6	1	40	7th	1¾	0	11
20	8th	9	5	11¾	41	8th	1½	0	10
21	Caudal 1st, having inferior processes	9¼	5	8	42	9th	1¼	0	7½
					43	10th	1	0	5½
					44	11th	0¾	0	3½

TABLE

OF DIMENSIONS OF THE V BONES IN SYDNEY SPERM WHALE.

No.	Length.		Width at top.	Breadth at widest part.
	Ft.	In.	Inches.	Inches.
1	0	4	4	4
2	0	11½	4	2¾
3	1	4	4½	5½
4	1	3½	6	7¾
5	1	2	5½	6¼
6	1	0¾	6	7
7	0	11½	6½	6
8	0	9¼	6½	6
9	0	8	6	7
10	0	6½	5½	6½
11	0	5	4¼	5
12	0	4	4	3½

OF THE RIBS.

The somewhat circular chest, on account of the disappearance of the neck, appears close to the posterior part of the head. The first, ninth, and tenth pairs of ribs have only one articulating surface to their proper vertebræ, but the second, third, and fourth, have two articulating surfaces, and the fifth, sixth, seventh, and eighth, have three. The ribs on the left side are of larger dimensions than the corresponding ones on the right, as the following table will show.

TABLE

OF THE DIMENSIONS OF THE RIBS.

No.	Length of ribs on right side.			Length of ribs on left side.		
		Ft.	In.		Ft.	In.
1	....	4	2	....	4	3½
2	....	5	7	....	5	9
3	....	6	2	....	6	2½
4	....	6	3	....	6	4
5	....	6	1¾	....	6	2
6	....	5	10	....	5	11½
7	....	5	4	....	5	6
8	....	4	10	....	4	10
9	Floating Rib	4	3	Floating Rib	4	3½
10	Ditto	3	5½	Ditto	3	6

OF THE STERNUM.

One of the more remarkable parts of the comparative anatomy of our Sydney specimen is the structure of the sternum. To understand this structure, it may be useful to bear in mind a remark of Geoffroy de St. Hilaire, that the bones of symmetrical animals are always in pairs, one ranged on each side of a theoretical spinal axis or medial line; so that a central, or what appears in nature to be an odd bone, such as a vertebra or a bone of sternum, must be considered theoretically as composed of two bones ossified together at their symphysis. Now, on referring to the *Delphinidæ,* which are perhaps of all *Cetacea* the nearest to the *Catodontidæ,* or sperm whales, we find (see Cuvier Oss. Foss. pl. 244, fig. 21) that *Delphinus Tursio,* or bottle-nosed dolphin, the sternum of which consists of three bones, has this binary structure marked out in the anterior bone, which is distinguished by a hole in the centre of the ossified symphysis,* and in the third bone by the trace of a central suture. In our Sydney sperm whale, the anterior bone must be described as two distinct sub-triangular ones joined by a cartilage in the middle; each with a wide head in front, and a deep emargination in the middle. These corresponding emarginations answer to the hole in the middle of the anterior sternum bone of *Delphinus Tursio,* which, as before said, has the two bones consolidated into one. So also Beale describes the anterior piece of the sternum in his sperm whale to be "perforated in the middle by an oblong opening." Unfortunately, M. Cuvier does not seem to have ever seen any part of the sternum of the Cachalot. He says, however, that the bottle-nosed dolphin has three bones in the sternum, of which the second is simply rectangular, receiving the articulation of the second pair of ribs

* It would appear according to Cuvier, that the true whales or genus *Balæna,* have not got this perforation in the solid anterior piece of their sternum; so that we have here another proof of sperm whales being nearer to dolphins than to true whales in their structure.

where it joins the anterior bone before described. In our Sydney whale this second piece of the sternum is composed of two distinct triangular bones joined together by cartilage; and which, if consolidated into one, would make an equilateral triangle, having its point directed towards the tail of the animal. These bones, in the Yorkshire whale, are consolidated into one flat irregular piece, and Beale describes a third piece which expands very much, and also a small ensiform portion. This last alone would show his animal to be a distinct form of sperm whale. The bottle-nosed dolphin has also a third bone, but Cuvier makes no mention of its having any "ensiform portion."

I have been fortunate in getting possession of the sternum of the other sperm whale thrown ashore in Botany, as it has led me to understand the structure of this part in such animals, as compared with the same in dolphins. Our two sperm whales may be said to have their sternum composed of six bones, three on each side of a cartilaginous medial symphysis. The first two form by their junction that anterior bone of the dolphins, so remarkable in some species for its medial perforation. But in the Botany sperm whale, each of these first two is ossified with the following two, which, when joined by cartilage, answer to the second bone of the sternum in *Delphinus Tursio.* The third two bones of the cachalots answer to the third bone of dolphins, but in our Sydney sperm whale these last are ossified with the foregoing two; so that we may say, that of the three bones on either side of the sternum, the Sydney whale has the two last anchylosed together, and the Botany whale the two first bones. Besides, the termination of the sternum is widely different in these two individuals. In our Sydney skeleton the two last bones converge to a point, whereas in the Botany specimen they diverge from each other with truncated summits, thinned off towards their inner edge. Does the sternum in the same species vary in this manner? Is it a sexual distinction?—or am I describing two different species? Unfortunately, the Botany sperm whale was in such a

state of decomposition when I saw it, and besides had been so much cut up, that I must confess it to be out of my power to determine these points. And I trust this uncertainty will be borne in mind when I come to describe the pelvis of the Botany sperm whale, which I have reasons for believing to have been a female.

In our Sydney whale, the sternal parts of its ribs are all cartilaginous, whereas in the true dolphins they are generally ossified. As I made my drawings of this singular sternum on the spot before the animal was divided, I have no doubt of the accuracy of the manner in which I have placed these bones in the skeleton; which, besides, is proved by the location of the bones in the Botany Bay sternum. Their dimensions are as follow in the Sydney specimen:—

	Feet	Inches
Length of sternum	3	0
Greatest breadth of ditto	3	0
Length of anterior bones	1	8
Greatest breadth of each of ditto	1	6
Least breadth of each of ditto.........	0	10
Length of posterior bones	1	4
Greatest breadth of each of ditto.......	0	8½
Breadth of each of ditto at point	0	2½

OF THE FINS, OR FOREPAWS.

I need scarcely state to zoologists that cetaceous animals have no clavicles. The scapula of the sperm whale forms a flat sub-triangular piece, having the blunt apex downwards and concave, while the base of this triangle is convex. The anterior margin goes off into a keel, offering at its external termination a flat triangular and blunt-headed process, representing the acromion; while the other margin lying close to the ribs, and where the scapula articulates with the humerus, projects forward in the form of a more styliform and pointed

process, which no doubt is the coracoid. The great size and the form of the acromion process agrees better with the structure of true whales, than with that of dolphins.* The following are the dimensions of the right scapula :—

	Feet	Inches
Length from upper part to glenoid cavity	2	3½
Breadth of upper part	1	10
,, narrowest part	0	11
,, lowest part	0	8½
Length of acromion process	0	11
Breadth of ditto	0	9½
Length of coracoid process	0	6½
Breadth of ditto	0	3
Length of glenoid cavity	0	8
Breadth of ditto	0	5½

With respect to the very short thick humerus, it is very nearly half the length of the scapula, and consequently in proportion to the scapula not so long as in the Yorkshire whale. On the opposite side to the head of the animal, there is a short and thick apophyse, so that the external side of the humerus presents a strong notch or emargination. This humerus expands very much at its carpal end, where it articulates with the radius and ulna. Beale says that in the Yorkshire whale the radius and ulna were ossified to the humerus. The following are the dimensions of the humerus in our Sydney specimen :—

	Feet	Inches
Whole length of humerus	1	2
Breadth of head	0	7½
Breadth of narrowest part	0	5
Circumference of ditto	1	2
Breadth of extremity	0	8½

* On comparing the figure of the scapula of our Sydney whale with that given by Cuvier of his London whale, a great difference may be discovered in the general form, and particularly in that of the acromion.

With respect to the radius and ulna, they are both constricted in the middle, and of much the same form, except that the globular olecranian process of the latter gives a peculiar character to this last, by its being very prominent as it turns towards the thumb. The following are their dimensions :—

	Inches
Length of ulna	$9\frac{1}{2}$
Breadth of upper part of ditto, including the olecranon, which projects so as to form a hook	$7\frac{3}{4}$
Circumference of narrowest part of ditto	10
Breadth of lower part of ditto	7
Length of radius..	$10\frac{3}{4}$
Breadth of head of ditto	$5\frac{1}{2}$
Circumference of narrowest part of ditto	11
Breadth of lower part of ditto	$6\frac{1}{2}$

The bones of the carpus are not articulated together, as in the more perfect mammals, but are imbedded in a mass of that cartilaginous substance which so often, in *Cetacea*, represents bony matter. This flat mass of cartilage, which takes the place of the wrist, is one foot two inches in width, and extends five inches from the radius and ulna to the metacarpal bones.

The carpal bones are six in number. Five of them are of rounded irregular shape, and are placed in a transverse row, one opposite to each finger. The sixth is a thin linear flat transverse bone, placed close to the radius, between it and the carpal bone of the thumb; so that the thumb may be considered as having two carpal bones. The largest carpal bone is about two inches in diameter. There is considerable discrepancy here between the description of Beale and mine as just given; but the true placing of the carpal and metacarpal bones, rudimentary as they are in *Cetacea*, and separately imbedded in cartilage, is a subject of considerable difficulty, unless

drawings of them have been made *in situ*. My drawing of these bones was made on the spot, before they were separated from the cartilage in which they were imbedded. If Beale be right, his whale has seven square carpal bones, but it is possible that by mistake he has included the first metacarpal bone of the thumb, among the carpal bones. Cuvier never saw either the carpal or metacarpal bones, or the phalanges of his specimens of sperm whales. The dimensions of our carpal bones are as follows :—

			Inches
First earpal bone of thumb,		length	$2\frac{3}{8}$
Ditto	ditto,	breadth	$0\frac{1}{2}$
Seeond carpal bone of thumb,		length	$2\frac{3}{4}$
Ditto	ditto,	breadth	$1\frac{3}{4}$
Carpal bone of fore finger,		length	$2\frac{1}{2}$
Ditto	ditto,	breadth	2
Carpal bone of middle finger,		length	$2\frac{3}{4}$
Ditto	ditto,	breadth	2
Carpal bone of fourth finger,		length	$2\frac{1}{2}$
Ditto	ditto,	breadth	2
Carpal bone of little finger,		length	$2\frac{1}{4}$
Ditto	ditto,	breadth	$1\frac{3}{4}$

The metacarpal bones, which are much compressed, and scarcely to be distinguished from the phalangeal, are in number, five being to all appearance the first joints of their several digits. That of the thumb is more dilated at the carpal end ; while the largest is that of the middle finger, and measures four inches in length, and three in breadth,—but I give the following as their general dimensions :—

	Inches
Metacarpal bone of thumb – Length	$1\frac{1}{2}$
,, Breadth at base	$1\frac{7}{8}$
Ditto of fore finger – Length	$3\frac{3}{4}$
,, Breadth at base..............	$2\frac{7}{8}$
Do. of middle finger – Length	4
,, Breadth at base	$2\frac{1}{2}$
Do. of fourth finger – Length	$3\frac{1}{2}$
,, Breadth at base.............	$2\frac{3}{8}$
Do. of little finger – Length	$3\frac{1}{8}$
,, Breadth at base..............	2

The phalanges gradually diminish towards the points of the fingers:

The thumb containing 2 bones, and a third phalanx of cartilage
The index finger.... 5 bones
The middle finger ... 5 bones
The fourth finger .... 3 and a fourth phalanx of cartilage
The little finger ..... 3 bones

OF THE PELVIS.

The pelvis, as I mentioned before, was not recovered from the whale of which the skeleton is set up. It is a skeleton, however, entire, except in this respect. I obtained afterwards from the other carcass on the open beach at Botany, although it was in an advanced state of decomposition, the greater part of those soft parts, in which, while the animal was alive, the pelvic bones were suspended. Unfortunately, one-half nearly had been carried away by the heavy seas which dashed on the beach, although enough remained in two bones of one side, to prove that the rudimentary pelvis of the sperm whale of the Pacific Ocean is of much the same construction as that of the right whale of the Southern Ocean, which, with that of the Cape Rorqual, was examined at the Cape of Good Hope for M. Cuvier, by M. de la Lande, as mentioned in the Oss. Foss., vol. ix., p. 302.

The situation of the bones of the pelvis, which are the only vestiges of the hinder legs of ordinary mammals, marks the place in the spinal column, from which these extremities, if they had existed, would have been suspended. The development of the V bones in *Cetacea* probably takes its origin in the total abortion of the ordinary hinder extremities of other *Mammalia.*

The pelvis in the sperm whale is not in immediate junction with the spine, but suspended in the flesh at some distanee from it. The antepenultimate of the lumbar vertebræ in our Sydney skeleton bears towards its extremity an impression which probably serves for the attachment of the strong muscles that support the bones of the pelvis. In the true whale of the Southern Ocean *(Balæna Australis)*, the pelvis is composed of three pieces, a middle and two more slender ones, whieh are articulated, one on each side of the former. So also it appears to be with the sperm whale, except that what answers to the middle bone of the true whale appears here to be composed of two arched bones. Thus, in reality, there are four bones, two on each side of the sperm whale, and they lie in the form of a crescent, of whieh the convex part is directed forward. These bones are situated in front of the anus, but are probably not joined together by any true articulation.

In Beale's Yorkshire whale, he describes a pelvis which is of a very different strueture from this. There, he says, the animal had two broad, flat, irregular and quadrilateral bones, ossified at their symphysis—a structure whieh approaches more to the pelvis of the Cape Rorqual *(Megaptera Poeskop* of Gray).

The largest of these pelvic bones in our Botany whale, is curved somewhat like a rib, convex on one side, concave on the other, broader at one extremity and at the other hooked back towards the convex side. The smaller bone, which perhaps answers to the os ilium in more perfect mammals, is subeylindrical, somewhat curved and thicker at the base than at

the extremity.* It is not unlike the corresponding bone in the pelvis of the Southern true whale, but is comparatively shorter and less slender. The dimensions of the bones are as follow :—

		Inches
1st Bone	Length	8
	Breadth at base	2¼
	Ditto at middle	1½
	Ditto at point	1½
	Thickness at middle	0½
	Thickness at hook	1
2nd Bone –	Length	3¾
	Greatest breadth	1¼

Still the subject of the pelvis in the genus *Catodon* obviously requires further elucidation by means of more perfect specimens. And here, I may remark, that it would be of great service to the promotion of natural science if the officers of whaling vessels, and persons having opportunities along the coast of Australia, would forward to our Museum specimens of the *Cetacea* of the Pacific Ocean, or their bones. It is indeed rather discreditable that our Colonial collection should not be in possession of any specimen of the common porpoise of Port Jackson (if it be a porpoise), or of the dugong of our north-eastern shores. The last deficiency is the more tantalizing, as although there is said to be a considerable fishery of dugongs so near to us as Moreton Bay, naturalists are still ignorant whether the Australian species be the same with the dugong of Java and Sumatra.

We have now finished our survey of the bony structure of the sperm whale of our Australian coast, and I think it has been quite sufficient to enable us to decide that this species is neither the same as Beale's Yorkshire whale nor yet as Cuvier's

* In page 88 of Beale, he mentions a bone of his Yorkshire whale, which, from its shape, I should imagine to be the same as this, but it is seven times the length, and he assigns to it a quite different use.

London whale: consequently that it is not the *Catodon macrocephalus* of Gray, that is, the common sperm whale of the European seas. Whether it be the same species as the *Physeter Australis* of Desmoulins—an apocryphal species, founded, as we have seen, on a sketch made by the master of an English whaler—may admit of doubt; since no description, properly so called, as yet exists of this last named species. I am inclined, indeed, to believe that more than one species of sperm whale will hereafter be shown to live in these Southern Seas. Still, as the epithet "Australis" is as applicable to our specimen as to any other of the genus, it has been judged proper to name it *Catodon Australis*, and I trust sufficient characters have been assigned by which this species may hereafter be distinguished from all others.

The skeleton set up appears to excite considerable interest among the curious of Sydney; and it is to be hoped that the foregoing observations will not merely serve to explain the osseous framework of a sperm whale, but also show the visitors of our Museum that the inspection of these dry bones ought to suggest to them reflections far more instructive than the vulgar admiration of their prodigious size. According to Beale, specimens are to be seen in the Pacific more than three times the size of this individual; and nevertheless, Madame de Staël's observation ought ever to be borne in mind: "*Le plus foible atome est un monde et le monde peutêtre n'est qu'un atome.*" Thus, the practised observer of nature knows that the smallest organisation may offer as complex a subject for curious study as the largest; and that an interest may attach itself to the sperm whale quite distinct from that due to its enormous dimensions, or even to its great use in human economy. We may, for instance, without being very profound naturalists, admire its truly mammal structure, disguised under the mask of a fish; its want of that symmetry which is so general in other vertebrated animals; its cup-like receptacle for the spermaceti which is to obviate in the ocean the enormous weight of such a mass of skull; its vertebræ locked into each other in two different ways, both however adapted

to combine the greatest strength with the power of effecting the object to which any part of the spinal column may be specially destined. We may, likewise, study the delicate mechanism of the paddles, and the manner in which the hinder legs, so necessary to the other orders of *Mammalia*, here disappear; or we may compare the small and simple bones that terminate the tail, with the accounts which whalers give us of their stoutest boats being dashed to pieces by the powerful cartilaginous flukes of which these weak bones form the axis. But it is almost impossible to detail the various subjects for meditation, which the inspection of such a skeleton may suggest to the minds of our visitors; and I shall, therefore, proceed to the description of another cetacean animal of the sperm whale family, which presents, as I believe, a form new to naturalists.

CHAPTER II.

ON THE EUPHYSETES GRAYII.

The enquiries for bones, which in my search for the pelvis of the sperm whale, I lately instituted along the coast in the immediate neighbourhood of Sydney, have excited such interest among settlers near the sea that I trust our Australian Museum is at length in possession of the nucleus of what hereafter will become a classical collection of the remains of cetaceous mammals. Such remains form the rarest specimens to be seen in European collections; and our immediate proximity to the Pacific Ocean affords to Sydney peculiar advantages for assembling materials, upon which a thorough investigation of this obscure department of zoology may be founded. One advantage already secured by my enquiries has been the discovery of a new animal, about nine or ten feet long, and the lodging an almost perfect skeleton of it in our Museum.

Mr. Brown, a gentleman residing in the neighbourhood of Botany, who had kindly assisted me in my search for the second sperm whale, sent me word in the month of September last that a young one had been thrown ashore at Maroobrah Beach, halfway between Coojee and Botany. To this place I immediately proceeded, and found half buried in the sand the remains of a cetacean that appeared to have been dead about six weeks. The rumour since has been that such an animal was about that time seen within the Heads of Port Jackson, and, being taken for a young sperm, was repeatedly fired at. Whether this was our animal, or such the cause of its death, cannot now be ascertained. The carcass, when I discovered it, had been so much devoured by native dogs and other animals of prey that no part remained of the external integuments except the flukes of the tail, the dorsal fin, the

thumb extremity of the right pectoral fin, the fore part of the top of the head, with the gums, and part of the under jaw with the teeth and lip attached. These parts are all much torn, but such as they were found they are preserved in the Museum, and they will serve to give us some idea of the external appearance of the animal.

Though a whale of the sperm family, with a short and very broad head, it was in appearance a dolphin, about nine feet long. Like a dolphin, it had a low snout, and rising from it a convex forehead, at the base of which was the large single blow hole placed at about the middle of the head.* The snout was turned up with amargin somewhat like that of a pig. In the gums of the roof of the mouth there was on each side a series of sockets for receiving the teeth of the under jaw ; these teeth were hollow, conical, and inserted somewhat horizontally in the sides of a very thin, narrow, sub-cylindrical under jaw. They were slightly curved upwards, so that their points should enter into the abovementioned alveoles of the upper jaw. The eye was situated low, in front of a very weak pectoral fin. There was a triangular dorsal fin like that of a dolphin, the rather convex front edge of it being inclined backwards at an angle of about 45°. The hinder edge of it was more perpendicular and concave. The perpendicular height of the point of this dorsal fin from the back was about $3\frac{1}{2}$ inches, and its base 6 inches wide. The caudal fin was triangular, with the terminating edge sinuated from each sharp point to the middle, where there was an emargination small but deep. Its breadth at the terminating edge in a straight line was two feet, and the length from the medial emargination that divided the flukes to the neck of the tail was about one foot. Such is all that I can say on the subject of the outward aspect, but the manner in which the points of the teeth are worn show this whale to have been a full-grown animal.

By repeated visits to Maroobrah Beach, by diligent search,

* As far as I can judge, this aperture appears to have been somewhat of a circular form, or it may have been lunate, with the horns of the lune directed forwards towards the point of the snout.

by sifting the sand, and offering premiums to residents near the spot for the recovery of the smaller bones, I have been able to collect an almost perfect skeleton. Indeed, it may be said to be complete, with the exception of the sternum, some phalanges of the digits of left paddle and one side, of which we are deficient in many of the ribs.

The skeleton, without the invertebral cartilages, is about eight and a-quarter feet long, while the skull from extremity of snout to the hinder edge of the occipital condyles, is sixteen and a half inches long. The great principle on which this skull has been constructed, is the same which prevails in the more enormous sperm whale described in the preceding chapter. There is the same want of symmetry, the same distortion of the component bones, the same concavity of the upper surface of the head, formed by the enormous development of the base of the maxillaries, and finally, the same convexity of the roof of the mouth. Here, moreover, we have some anomalies that render the formation more divergent from that of dolphins, than even is that of the skull of a true sperm. For instance, owing to the great breadth of the vomer, we have a snout forming from the notches almost an equilateral triangle, but with its apex blunt and emarginate; the point of the snout is thus short, truncated, and emarginate, instead of being long and sharp as in the true sperm. Here, also, the intermaxillaries barely pass beyond the point of the maxillaries; although, as in the true sperm whale, the right intermaxillary mounts nearly to the occipital, high above the right nostril, which is, as it were, almost carved out of it. A great distinction is here perceived from the structure of the genus *Catodon*, for instead of a perpendicular and semicircular wall, formed by the maxillaries and doubled by the occipital, forming the back of the great cavity on the summit of the head, we see this cavity, although it is completely formed at the back by the maxillaries, divided as it were into two unequal parts by a ridge of bone which is twisted towards the left side of the head. This prominent, thick, and sinuated ridge, which in the middle of the forehead separates the two unequal

cavities, is formed by the base of the left maxillary and the base of the right intermaxillary, which both meet at the summit of the head. The right intermaxillary, however, does not join the occipital, but is separated from it by a thin edge of the right maxillary, so that the occipital is doubled in front by the base of the maxillaries alone; in this way the left intermaxillary is much shorter than the right one, and mounts no higher than the wall of the left nostril, which it partly forms. It is the enormous width given to this left nostril that thus distorts the bones. The vomer forms with the sides of the intermaxillaries a broad hollow canal, in the middle of which it tapers away to a point which divides that intermaxillary emargination which terminates the broad snout.

The nostrils are pierced in the middle of the upper surface of the head, not, perhaps, so obliquely as in the genus *Catodon;* but they are here much more unequal in size, one being more than ten times the size of the other. The nasal bones are in this manner thrown completely out of their place. The right one is a very small triangle, at the base of the ethmoidal, which forms, with the right intermaxillary, the wall of the small right nostril. It also forms the lower edge of the dividing ridge, and terminates abruptly and perpendicularly above the base of the vomer. The left nasal bone is more than two inches long, and somewhat of a parallelogram in shape. With the left intermaxillary, the left maxillary and the ethmoid together, it forms the wall of the enormous left nostril.

In this animal, as we have said, the two massive maxillaries touch each other behind where they are doubled by the occipital, and leave no part of the frontal visible. A notion of their heavy proportions may be obtained from the fact, that a section of the right maxillary, taken through the right nostril, perpendicular to the medial line of the head, would be a triangle, having four inches and a half for its base, and about one inch and a half for its height.

Of all the orders of *Mammalia* the structure of the skull varies most in the *Pachydermata* and *Cetacea*; indeed, the

skull of our animal is as distant in organization and form from that of a dugong, as the cranium of an elephant is from that of one of the *Edentata*. But the peculiarity of the skull in carnivorous *Cetacea* is, that their face is almost entirely formed of the maxillaries and intermaxillaries, the nasal bones being very minute, and out of the ordinary place; while the frontals, separated from each other by the aforesaid predominant bones, are each thrown down on the sides of the head, forming the front side of a *fossa temporalis* as large as the orbit itself, and still more completely closed.

The frontal, in our animal, is a heavy quadrilateral piece, with concave sides, one of which forms the top of the orbit. A point of the maxillary comes near to the front angle of this orbit, and its posterior wall is formed by part of the zygomatic apophyse of the temporal, which, however, does not join the post-orbital apophyse of the frontal, but leaves it open in this place. The lower part of the orbit has its front side formed by a short thick triangular jugal, which in our specimen is not quite entire. The *fossa temporalis* is of a pear-shaped form, the point of which is open, and directed obliquely in front downwards.

The occiput falls almost vertically from the top of the head. It is sinuated behind on each side, a slight cavity being at the summit. From this it gently projects to form the oval eminence of the occipital condyles. The *foramen occipitale* is oval; its vertical height being two inches, and the width one inch and a half. The occiput itself, which is eleven inches high by one foot in width, has its lower edge on each side divided into two lobes, of which the external one makes an acute angle.

The under side of the skull or roof of the mouth is convex, like that of the true sperm whale, but otherwise presents considerable differences. For instance, only two small points of the intermaxillaries show themselves on each side of the line of the vomer to form the snout, which is almost entirely composed on the under-side of the enormous maxillaries. These have each in their middle

a linear groove five inches and a half long, running up from the front of the snout, and which probably marks the place of the bottom of the sockets, which are formed deep in the gum of the upper jaw, for the purpose of receiving the points of the teeth of the under jaw.

The palatines are small and quadrilateral. The pterygoideans very large, form two angular apophyses behind, separated from each other by a deep emargination of an elliptical form.

The lower jaw is a singular contrast to the upper; the former being as slight and fragile as the latter is massive and strong. So weak is the connection of this under jaw with the skull, that the articulating condyles are scarcely to be detected. The broad branches are nearly as thin as paper, and although the sides are reflexed inwardly, as in dolphins, the doubling, so as to form the hollow tube, does not occur as in them, near the base of the jaw, but within three inches of the symphysis. Each triangular branch, which at the articulating base is semicircular and about four inches high, and convex on the outside, is, from its extreme thinness, almost transparent. The symphysis, which is short in comparison to that of the genus *Catodon*, is boat shaped and carinated. From its sides project horizontally about thirteen teeth, curved gently upwards on each side. The longest of these is situated about the middle of the symphysis, and is about one and a quarter inch long. They have all single roots implanted in single sockets. They are all about half hollow, as in the true sperm whales, but being so much longer, thinner, and sharper in proportion, give the animal a quite different aspect, and perhaps a more ferocious one. Nevertheless, so extremely feeble an under jaw demonstrates that the long sharp teeth serve merely for the purpose of retaining the weak mollusca which, no doubt, form this creature's prey.

DIMENSIONS OF THE SKULL OF EUPHYSETES GRAYII.

	Inches
Length of skull from extremity of snout to the hinder edge of occipital condyles	16 1-2
Ditto of skull from hinder edge of occipital condyles to the posterior wall of the right nostril	6
Ditto of snout from its extremity to the bottom of the antorbital notch of the maxillary	7
Breadth of head between the orbits	14
Greatest width of ridge dividing cavity of head	3 1-2
Ditto of snout between the antorbital notches of the maxillary	8
Ditto of snout at half distance between its extremity and the antorbital notch of maxillary	5
Ditto of snout at extremity	2
Width between outer edges of intermaxillaries at the line drawn between antorbital notches of the maxillary	3 3-4
Distance between the suborbitary (or here, superorbitary) foramina	4 1-2
Distance between anterior points of the intermaxillaries	1 1-4
Greatest distance between the inner walls of the raised edges of the maxillaries	9 1-5
Width of left nostril	2 1-5
Length of ditto	2
Width of right ditto	1
Length of ditto	1-2
Height of occipital crest above the right nasal bone	5 1-4
Ditto of ditto above the left nasal bone	7 1-2
Width of the occipital foramen	1 1-2
Distance between the outer edges of the occipital condyles	4
Greatest breadth of the occipital at its lower part	11
Height of the occipital from the inferior edge of the basilar to the summit of the head	11
Length of lower jaw in a straight line	13 1-4
Ditto of the symphysis	3 1-2
Ditto of the series of dentary alveoles	5 1-4
Distance between outer edges of the articular condyles	13
Height of the mounting branches at base	4 1-4
Width of jaw at the place where the symphysis commences	1 1-4

THE OS HYOIDES.

The os hyoides of our animal is remarkably similar to that of the true sperm whale, and principally differs in that the lateral pieces are still more rounded; while the anterior apophyses of the middle piece are deficient. This structure is, therefore, further removed from that of true whales and dolphins than even the os hyoides of the genus *Catodon.*

The styloidean processes are sub-cylindrical pieces, thicker at each extremity.

	Inches.
Length of middle piece	$3\frac{1}{4}$
Width of ditto	4
Greatest thickness	$\frac{5}{8}$
Length of a horn	3
Width of ditto	$2\frac{1}{2}$
Length of styloidean	4

OF THE EAR.

As in the true sperm whale and dolphins the small bones of the ear are confluent into one stony piece, which is suspended in a cavity of the head close to the temporal bone. It may be divided into three parts, viz.: the labyrinth, tympanum, and the somewhat prismatic base from which they both spring as from a fibrous root. The larger portion of the labyrinth has externally six points, and the other portion, which is spherical in *Catodon*, is here oval as in dolphins. None of the four holes which almost in a line separate the oval part of the labyrinth from the larger portion, are here pierced in a cavity distinct from any of the others. In dolphins, on the other hand, there is one large semicircular hole in which three smaller ones are pierced, leaving the fourth hole outside something as in *Catodon*, only still further removed from the structure of the ear in our animal. The tympanum resembles the shell called a cone with a wide longitudinal mouth, and in other respects the ear resembles that of the *Catodon* more than the ear of the dolphin.

Having now given a pretty full description of the head of this small whale, it seems high time for us to consider the name that ought to be given to it.

The character which Mr. Gray, of the British Museum, has ascribed to his short-headed toothed whales, or his genus *Kogia* is as follows:—" Head moderate, broad, triangular. Lower jaw wide beneath, slender, united by a short symphysis in front. Jaw bone of skull broad, triangular, as broad as long."

Now De Blainville (Ann. Anat. Phys. III. t. 15) had previously by means of a single skull from the Cape of Good Hope, and which is lodged in the Paris Museum, distinguished a cetacean mammal under the name of *Physeter breviceps,* with the following characters, viz.:— " Skull very broad and high. The frontal crest very distinct, and the nasal pit very deep, rather like that of the cachalot. Nose very short and pointed, very rapidly tapering, only one inch longer than the breadth of occipital bone. The lower jaw is very wide apart at the condyles, bent sharply inwards, and united in front by a moderate symphysis and very narrow, but rounded at the end. Teeth, fourteen or fifteen, narrow, slender, conical, acute, and rather arched inwardly; length of skull, fourteen inches six lines; lower jaw, thirteen inches; separation of the condyles, twelve inches; symphysis, about two-ninths of length of lower jaw; beak, the length of width at the notch. This skull bears no resemblance to the skull of the young sperm whale." And it was upon these few facts recorded by De Blainville, that Mr. Gray founded his genus *Kogia,* with the above-mentioned character.

The Sydney animal, whose head has been described above, may be called *Euphysetes,* and as a genus, the following characters may be assigned to it, viz.:—Head moderate, rounded behind, and subtetrangular in front where the base is broad, and the snout truncated, slightly reflexed, and marginated at the extremity; the spermacetic cavity of skull is longitudinally divided by a bony ridge near the occiput; single blowhole externally situated in middle of head at base of snout; lower jaw, wide at the condyles, having the branches in front united into a short

narrow symphysis, with about twenty-six teeth, thirteen on each side.

The following measurements will show the relation between the genus *Kogia* and this new genus *Euphysetes*.

	Kogia.	*Euphysetes.*
	Inches.	Inches.
Total length of skull	14½	16½
Greatest breadth of ditto		13½
Breadth of ditto at notches ...		13
Length of beak	6 1-7	7
Breadth of ditto at notches	6 1-7	9
Length of under jaw	13	14½
Width apart of condyles of ditto	12	12
Length of the symphysis	2 8-9	3½

As our animal, therefore, comes obviously near to the *Kogia breviceps* of Gray, who founded the genus on the description by De Blainville of a skull of his *Physeter breviceps*, it may be incumbent on me to state why a new name has been adopted, namely, *Euphysetes Grayii.*

In the first place, the jaw bone of our animal is not as broad as long. The nasal pit is totally unlike that of the cachalot. The nose (if by nose be meant snout) is not pointed, but very truncated or blunt in the skeleton as well as in the perfect animal; moreover, instead of the nose being one inch longer than breadth of occipital bone, this is to the length of snout in the proportion of about fourteen to eight. The teeth instead of being fourteen or fifteen are in number twenty-six. Again the beak, instead of being as long as it is wide at the notches, has its length in proportion to this width only in the proportion of seven to nine: and so on. The few characters given by De Blainville and Gray show sufficient divergency from the form of our animal, and they incline me to leave the name *Kogia breviceps* for the whale that may

be found to suit the above description of it as recorded by those gentlemen. I must however in candour confess that I am disposed to suspect that the Paris skull has been badly described, and that it may possibly after all belong to the same genus as our cetacean. On the other hand, it is almost incredible, if the genus *Kogia* be identical with our *Euphysetes*, that Mr. Gray should have been silent on what certainly is by far the most remarkable character of the latter's skull, namely, the heavy ridge of bone that longitudinally divides the spermacetic cavity into two unequal parts. There has been nothing like this structure hitherto described among *Cetacea*.

It is to be regretted that a barbarous and unmeaning word like *Kogia* should have been admitted into the nomenclature of so classical a group as the *Cetacea;* and with respect to De Blainville's trivial name *breviceps*, however good and characteristic it may have been in conjunction with the genus *Physeter*, it is manifest, that when once these animals with short heads are separated generically from true sperm whales, such a name has the defect of belonging to all the species that may be found in the genus, and consequently becomes a generic instead of a specific epithet. There has, therefore, in the naming of our animal been an endeavour to avoid both these defects, and it has been called *Euphysetes Grayii;* where the word *Euphysetes*, namely, *a good or easy blower*, alludes to the enormous size of the left nostril, and the specific name is given in honor of J. E. Gray, Esq., chief of the Natural History Department in the British Museum, a gentleman who has much distinguished himself in the study of this order of mammals.*

OF THE SPINAL COLUMN.

The *Euphysetes Grayii* has forty-four vertebræ in

* If some odoriferous hero of the harpoon should here sing out, "Give us a plain English name, and no nonsense;" I have the satisfaction to inform him that he can with considerable propriety call this whale "the new codger," and thus distinguish it from "*the old codger*," which is Mr. Gray's *Kogia breviceps*.

addition to the seven eervieal ones; but these eervieal vertcbræ are all so eonfluent and soldered together, as it were, into onc bonc, that it is morc diffieult to distinguish them from each othcr than perhaps in any other eetaeean, although the soldering of all the scven cervical vertcbræ into onc pieee occurs not unfrequently among the dolphins.

In this sublunary ereation, every organie strueture passcs off gradually to some other onc; and it is in eonsequcnce of this law of nature that almost all eharacters, however distinetivc of groups they may appear on a first glanee, will be found to give way at somc point or other of any series whieh forms a group. Few characters, for instance, ean more gencrally denote the class of *Mammalia* than their seven cervical vcrtebræ. The atlas, thc axis, and the five othcrs are all to be seen distinet in thc dolphin of the Ganges, as wcll as in the swan-like neek of the camelcopard. Among the sloths however, we find one species with nine cervical vertebræ, and on the othcr hand among *Cetacea* we often see thcir seven eervical vertebræ soldered togethcr into onc. The sperm whale, or *Catodon*, as wc havc sccn, has its atlas distinet, but its axis and the following five vertebræ are soldered together into one piece. Whcn a eharaeter of this kind brcaks down, it beeomes, from its tendeney to vary, of little more value than to distinguish species. Thus *Delphinus delphis*, *D. globiceps*, *D. griseus*, and *Phocæna communis*, as also the genus *Hyperoodon*, have all the eervical vertebræ soldered togethcr. *Delphinus Tursio* has thcm all distinet, as well as the *Platanista* or *Delphinus Gangeticus*, Linn. In the Cape Rorqual thc atlas is distinet, and also thc four last vertebræ, but aecording to Cuvier the axis and thc third joint are soldcrcd togcther. In thc Cape whale thc whole sevcn are confluent into one pieee.

In the *Euphysetes Grayii* thc onc bone, whieh is formcd of the seven cervieal vertebræ, has the atlas and axis markcd out in it by their superior blunt eonieal transversc apophyscs, as in thc Cape whale; thcir inferior apophyses being evanescent as in dolphins. The third and fourth vcrtebræ are thick,

each marked by a short conical superior transverse apophyse, and having a separation, from each other and from the axis, distinguished by four lateral holes, while the vestiges of the fifth, sixth, and seventh vertebræ are thin as paper, and soldered on to the back of the preceding ones. The superior transverse apophysis of the third and fourth vertebræ are also distinguishable, although those of the right side are more developed than those of the left;—a character, by the way, belonging to the whole of this compound bone as well as to the spine generally. The vertical apophyse of all the joints may be considered as uniting to form one short cone on the back of the neck. The dimensions of this compound cervical vertebra are as follow :—

	Inches.
Total width	$5\frac{5}{8}$
Vertical height	$4\frac{1}{2}$
Length	$2\frac{1}{8}$
Width of foramen	2

There are of dorsal vertebræ 14
Lumbar ditto.... 9
Caudal .... 21 } 13 with V bones attached. 8 terminal.
—
Making a total of vertebræ.. 45, if the cervical vertebræ be counted as one.

TABLE

OF THE DIMENSIONS OF THE VERTEBRÆ OF EUPHYSETES GRAYII, IN INCHES.

No.	Total width.	Total Height.	Total Length.	Width of spinal foramen.	Height of vertical apophyse	Length of transverse apophyse	Width of the dilatation of transverse apophyse	Width between the two upper points of the transverse apophyse	Remarks.
1	5 5-8	4 1-2	2 1-8	2	1	3-4	..	..	Compound cervical vertebra.
2	4 1-2	4	1 1-4	1 3-4	3-4	1 1-2	..	..	First dorsal vertebra.
3	5	5 1-2	1 1-4	1 1-2	2 1-2	1 7-10	..	..	In this vertebra the transvers apophyse begins to dilat horizontally and to exten over the upper branches of th transverse apophyse of th preceding vertebra.
4	5	6 1-8	1 7-10	1 3-4	3	2	..	..	
5	4 7-10	6 3-5	1 4-5	1 4-5	3 1-2	1 1-2	1 1-2	..	
6	4 3-10	6 7-10	1 9-10	1 4-5	3 1-2	1 1 2	1 4-5	..	Here first the emargination c the transverse apophyse be comes visible.
7	4 1-10	7 1-5	2	1 1-2	3 1-2	1 1-2	2	..	
8	4	7 1-5	2	1 1-5	4 1-5	1 1-2	2 1-5	..	
9	4 2-5	7 1-2	2	1 1-5	4 1-2	1 7-10	3	1 1-10	
10	5	7 1-2	2	1	4 1-2	2	3 1-2	9-10	
11	6	7 1-2	2 1-5	1	4 4-5	2 1-5	4	9-10	
12	6 1-2	8	2 3-10	1	4 9-10	3	5	9-10	
13	7	8 1-5	2 1-2	1	5	3 1-5	5	9-10	
14	7 1-2	8 1-2	2 1-2	1	5	3 2-5	5 1-5	9-10	
15	8 3-5	8 1-2	2 1-2	1	5	3 3-5	5 1-2	9-10	Last of the dorsal vertebræ.
16	8 4-5	8 9-10	2 1-2	1	5 1-5	3 1-2	5 3-5	4-5	First lumbar vertebra, whe the inferior carina first be comes emarginate.
17	8 4-5	9 1-5	2 4-5	1	5 2-5	3 1-2	5 3-5	4-5	
18	8 3-5	9 1-5	2 4-5	1	5 1-5	3	5 1-2	7-10	
19	8 1-5	9	2 4-5	1	4 4-5	3	5 2-5	7-10	
20	8	8 1-2	2 4-5	7-10	4	3	5 2-5	3-5	Here the inferior carina is lon est, the horn of the lune bei 1¼ inch long
21	7 1-2	8	2 4-5	6-10	3 1-2	2 1-2	5 2-5	3-5	Last of the lumbar vertebr where inferior carina ceas to be emarginate, and al first appearance of artic lating surface for V bones.
22	7	6 3-5	2 4-5	1-2	3 1-5	2 1-5	5 2-5	3-5	
23	6 1-2	5 4-5	2 3-5	1-2	2 1-2	2 1-5	5	3-5	
24	5 3-5	5	2 2-5	1-2	2	1 1-2	4 1-2	3-5	
25	5 1-2	4 4-5	2 2-5	1-2	1 1-2	1 2-5	4	1-5	Last vestige of bifurcation superior branch of transver apophyse.
26	4 1-2	4	2 1-5	1-2	1 1-5	1 1-5	3 1-2	.	
27	3 4-5	4	2 1-5	1-2	1	4-5	3 1-5	..	
28	3 2-5	3 1-2	2	1-2	4-5	3-5	3	..	
29	2 4-5	3 2-5	1 4-5	2-5	1-2	2-5	2 1-2	..	
30	2 2-5	3	1 4-5	2 5	2-5	1-5	2	..	
31	2	2 4-5	1 3-5	2-5	2-5	..	Transverse apophyse here altogether becomes indistinct	..	
32	1 4-5	2 1-2	1 1-2	2-5	2-5	..		..	
33	1 3-5	2 1-5	1 1-2	3-10	1-5	..		..	
34	1 3-5	1 4-5	1 2-5	1-5	..	..		..	Here medullary foramen fi opens, and the last of the bones occurs.
35	1 2·5	1 2-5	1	1 5	..	..		..	
36	1 2-5	1 1-5	1	1-5	..	..	..	..	
37	1 2-5	1	4-5	..	..	..	..	..	
38	1 2-5	4-5	4-5	..	..	..	..	..	
39	1 1-5	3-5	4-5	..	..	..	..	..	
40	1	3 5	3-5	.	..	..	..	..	
41	9-10	3-5	3-5	.	..	..	..	..	
42	4-5	1-2	1-2	..	..	.	..	..	
43	3-5	2-5	2-5	..	..	..	..	..	
44	1-2	2-5	2-5	..	..	..	..	..	This globular joint is deficie but its place is marked o in the part of tail that w found.
45	2-5	2-5	2-5	..	..	..	..	..	

To judge from the articulating surfaces, there are about thirteen V bones in this animal. Of these, however, only seven have been found, the first of which belongs to the twenty-fifth vertebra. The following table will express their dimensions, and also the particular vertebræ to which they were attached by cartilaginous ligaments :—

No. of the vertebra.	Breadth of the V bones found.	Height of the V bones found.
	Inches.	Inches.
25	2 2-5	2 1-5
29	1 2-5	1 1-2
30	1 2-5	1 2-5
31	1 1-5	1
32	1 1-5	3-5
33	4-5	1-2
34	1-2	2-5

OF THE RIBS.

The ribs are not very round as in *Catodon*, but flattish and often somewhat angular. The animal is thus more compressed, that is, narrower and deeper in proportion than *Catodon*. Instead of ten pair of ribs, as in the true sperm whale, the *Euphysetes* has no less than fourteen pairs, of which the last pair are merely minute rudimentary bones floating in the side of the animal and entirely disjoined from the vertebral axis. The first rib, which is broad and flat, is bent in the middle almost at right angles, and has but one articulating surface; that is, to the transverse process of the first dorsal vertebra. The seven following pairs have each two articulating surfaces for each consecutive two of the first seven vertebræ, and the next five pairs have only one articulating surface for each rib. All the ribs are more or less arched,

but beeome rapidly straighter and shorter until the fourteenth, whieh is only about one inch and a-half long, and has the slightest possible eurvature. The length of the ribs are as follows—but it must be reeolleeted on the view of these dimensions that, exeept the first, we possess no rib of the left side. Possibly the ribs of left side, if known, would prove smaller than their eorresponding ribs. Thus the right transverse apophyse of the ninth vertebra is perforated on the side, but not the left one, although there is an open groove in it for the passage of the left tendon. In the same way the thirteenth and fourteenth vertieal apophyses are perforated on the right side of the emargination, but on the left side these holes are open as usual, and only grooves.

Rib.	Inches.	Rib.	Inches.	
1st	15	8th	22	These ribs have a longitudinal groove in their middle.
2nd	20	9th	20	
3rd	24	10th	18	
4th	25	11th	16	
5th	24½	12th	14½	
6th	24	13th	11½	
7th	23	14th	1½	

OF THE STERNUM.

Only one of the pieces of the sternum was at first found, and this would appear to be the middle one. It is composed of two bones eonfluent at one of their sides, as is made evident by a longitudinal medial furrow on the outside. The shape of this pieee is unsymmetrieal, but quadrilateral, the right component bone being somewhat larger than the left one. The dimensions of the entire bone are as follows:

	Inches.
Length of medial line	$1\frac{1}{2}$
Width at top	2
Width at bottom	$1\frac{3}{4}$

Very lately, however, by sifting the sand, another and smaller bone has been detected, which appears to be one of the component bones of the terminal or third piece of the sternum. What is most worthy of notice in it is, that it shows the sternum of *Euphysetes* to have been terminated by two distinct flat triangular bones, almost exactly as in the Sydney *Catodon*. This terminating bone has the points of the triangle blunt or rounded off; the base of it is rather more than three-quarters of an inch long, and the sides are each about one and a-fifth inches long.

OF THE PECTORAL FINS.

It will be seen from the following description of the hands, fore extremities, or pectoral fins of the *Euphysetes*, that it possesses in these organs no strength in proportion to that which exists in the fins of the true sperm whale. Indeed in all the *Cetacea* the pectoral fins can, from their feeble structure, be of little use as organs of locomotion, and probably are principally of service in supporting their young. In our animal the scapula is a remarkably thin, flat, smooth bone, with scarcely any convexity. Indeed the little convexity which exists in this broad subtriangular plate is towards its fore edge, where this convexity is turned towards the ribs. The upper edge of this scapula forms nearly the quadrant of a circle. Its posterior edge is concave, and the anterior edge sinuated somewhat in the shape of an *ʃ*. The outer crest of the base of this scapula gives rise to the acromion, which is also a thin subtriangular plate, and from the

inner ridge a thicker and more solid coracoid apophyse projects in the shape of a parallelogram.

DIMENSIONS OF THE SCAPULA.

	Inches.
Greatest length	8
Width of convex side	10
Ditto concave side	5 1-5
Ditto anterior side	6 1-2
Breadth of neck	3
Projection of the acromion	3
Greatest height of ditto	2
Projection of coracoid apophyse	2
Height of ditto at the extremity	1 1-5

With respect to the humerus, that apophyse on the front edge of it which is so conspicuous in true sperm whales, and which represents the deltoidal crest, is here very little prominent, but in length it occupies more than one-half of the front edge. The humerus itself is flatter than in *Catodon*, very concave behind, and in front presenting a waved edge.

	Inches.
Total length of humerus	4
Greatest width of ditto	2 1-5
Semi-diameter of hemispherical head.	2

The cubitus or ulna is not confluent or soldered to any other bone, but perfectly a distinct piece, like the radius. The thin posterior edge of the cubitus is waved, and the olecranian apophyse projects so very little as to make its base not wider than the other end of it. The radius is in shape and dimensions very like the cubitus, only it is thicker and more solid. The width of radius at top and bottom is nearly the same, only in the middle it is constricted and flattish as well as the

ulna. The latter however has a small convexity in the middle of its outer margin under the semicircular olecranian process—

	Inches.
Length of cubitus	2 1-2
Width at base, including olecranian apophyse....	1 4-5
Width at neck	1 3 10
Length of the radius	2 1-2
Width at top	1 3-5
Width in the middle.	1 1-2

The carpal bones are in the *Euphysetes* not so far separated from each other by cartilage as in the *Catodon.* They are seven in number ; viz. : two linear transverse bones and five of a flat, round, irregular shape, a small hexagonal one of which is placed between one of the transverse bones and the metarcarpal bone of the thumb. This transverse carpal bone is sub-triangular, and placed at the termination of the radius. The remaining thin transverse bone is trapezoidal and situated between the base of the ulna and the two outer carpal bones. The forefinger has also two large flat carpal bones, placed between the corner of the radius and the metacarpal bone of the fore-finger. Of these two carpal bones the one nearest the radius is pentagonal, and the other hexagonal. From one side of the hexagonal bone proceeds the metacarpal bone of the third finger. The largest carpal bone, which is subpentagonal, lies between the trapezoidal transverse carpal and the metacarpal bone of the fourth finger, while a small subquadrangular carpal bone joins the outer edge of the linear trapezoidal carpal with the metacarpal bone of the little finger. This position of the carpal bones among themselves, so widely different from the disposition of them in the pectoral fin of the true sperm whale, is nevertheless certain; but the way in which they are connected with the metacarpal bones is not so certain, as only the bones of the thumb and fore-finger, part of the right fin, were found *in situ.* Almost all the smaller bones

of the fins were detected by sifting the sand on the beach, and those of the left fin remain still imperfect. As in the true sperm whale, the metacarpal bones appear as the first joints of the five fingers, that of the thumb being the most dilated at the carpal end.

The phalanges appear gradually to diminish towards the points of the digits, and the right fin is so perfect that we may account the thumb to contain two phalanges, the index six, the middle finger six, the fourth finger four, and little finger three, perhaps only two.

OF THE PELVIS.

The pelvis in the *Euphysetes*, as in *Catodon*, is composed of four bones suspended in the flesh, but they are of very different form. The two middle ones are quadrangular, each longer than broad, flattish on one side and triquetral or prismatic at the end where it articulates with the second kind of pelvic bone ; this second kind is a broad subquadrangular bone, thickest at the middle point of its inner side where it articulates with the former, and from that articulation it flattens out into an oval suspended obliquely in the flesh. A suspicion here arises in the mind of any person conversant with Beale's description of the pelvis in his Yorkshire whale, that as his words will so accurately suit the two exterior bones of our *Euphysetes*, it may be possible that the two middle ones of that specimen were lost, or at least not detected. Indeed these bones, from lying insulated in the flesh of the belly, are difficult to find, and in consequence it is very rare that the few skeletons of *Cetacea* in museums are provided with them.

The dimensions of the bones of the pelvis in the right side of *Euphysetes* are as follow—

	Inches
Middle Bone—Longest side	$1\frac{3}{4}$
Opposite side to same	1
Shortest or triquetral side	$0\frac{5}{8}$
Opposite side to same	$0\frac{7}{8}$
Exterior Bone—Articulating side	$1\frac{1}{2}$
Longest side	$1\frac{3}{4}$
Curved side	1
Shortest side	$0\frac{3}{4}$

We have thus passed in review the several parts of a cetacean whose bony structure comes very near that of the common sperm whale. Nevertheless, its external form demonstrates how little importance is to be attached to most of those characters which have been hitherto considered by Lacepède, Cuvier, and other great zoologists, to be ordinate. Here, for instance, we have a sperm whale, with a short moderately sized head, and a depressed snout like that of a dolphin, with a dolphin's falcate dorsal fin, and single blow-hole situated in the middle of the head, at the base of the snout. As for the want of teeth in the upper jaw, it has already been shown to be common among dolphins.

The discovery of the *Euphysetes Grayii* is useful in many respects. It shows the error of the two brothers Cuvier in discrediting the existence of the black fish of the northern hemisphere; it shows the mistake of Professor Bell in assigning the black fish of our whalers to the same genus as the common sperm whale; it shows, at the same time, the accuracy of the ancient descriptions of the black fish by Sir Robert Sibbald and Otho Fabricius*; and finally, the shrewdness of Mr. Gray, in eliciting from such a mass of confusion so much correct information respecting an animal

* It is very possible, nay, probable, that the black fish of Otho Fabricius is a different species from that of Sir R. Sibbald, particularly if it be true that the former has only 22 teeth in all; for the latter has 21 teeth on each side of under jaw, making 42 in all.

which he only knew by Sir Robert Sibbald's figure. The truth is, that the *Euphysetes* comes much closer in external appearance to the black fish than to the sperm whale. It in a manner proves the existence, now or formerly, of such a species as Sibbald and Fabricius described from the northern part of the German Ocean. Like the *Euphysetes*, the black fish is said to have a round head with a depressed and truncated snout; it had also a dorsal fin, and its blowhole was situated on the middle of the head. Now, as the skeleton of the *Euphysetes* comes so near to that of *Catodon*, it is impossible that Mr. Gray can be wrong in considering the black fish (the *Physeter Tursio* of Linnæus) to belong truly to the family of sperm whales.

The known genera that belong to the family of *Catodontidæ* may by their external appearance be shortly characterized as follows, viz.:—

No dorsal fin, but only a hump instead. Blowhole at the extremity of snout.	1. CATODON.	Head between a third and fourth of the whole length.
	2. KOGIA?	Head moderate, triangular, and pointed in front?
Dorsal fin. Blowhole on middle of head.	3. EUPHYSETES.	Head moderate, like that of a dolphin, and truncated in front.
	4. PHYSETER.	Head half length of rest of skeleton? Blowhole covered by an operculum or flap?

But of anatomical characters by which we may separate the *Euphysetes* from all other described genera of the sperm whale family, there is none so striking as that ridge of bone which divides the back part of the spermacetic cavity into two lesser cavities nearly equal in size.

CHAPTER III.

CONCLUDING REMARKS.

In this short chapter I propose to discuss, first, the osteological affinities of the *Catodontidæ,* or family of sperm whales; secondly, the true characters which distinguish that family,—and thirdly, the causes of their rarity.

The first of these questions regards the animals to which the sperm whale family, in the structure of their skeleton, come the nearest. I have already, in a multitude of points, shown their close affinity to the dolphin family, and the following series of *Delphinidæ* is arranged very nearly in the manner that Mr. Gray has, in his late work on *Cetacea,* considered to be the natural disposition of these animals.

DELPHINIDÆ.

Normal Group, FLUVIATILE. Symphysis of under jaw more than half length of jaw, and much compressed.	*a.* INIINA, *Gray.*	Maxillary bones horizontal.
	b. PLATANISTINA, *Gray.*	Maxillary bones rising vertically on edge, so as to form a crest over the nostrils.
Aberrant Group. MARINE. Symphysis of under jaw not half length of jaw.	*c.* HYPEROODONTINA, *Gray.*	Upper jaw toothless. Maxillary bones raised vertically on edge, so as to form a crest over the nostrils.
	d. MONOCERATINA, *Gray.*	Upper jaw with few teeth. Maxillary bones sub-horizontal, and rather plane.
	e. DELPHININA, *Gray.*	Upper jaw with many teeth. Maxillary bones sub-horizontal and plane.

But if such be the series of natural affinity among the true dolphins, it must be confessed that it is very difficult to discover good characters, founded on the skeleton, by which sperm whales can be excluded from the group. It is very clear that our two Sydney whales described in the preceding chapters touch the above series at some point between *Platanistina* and *Hyperoodontina*; for they have the toothless upper jaw of the latter tribe of dolphins, and that long symphysis of the under jaw which is so remarkable in the fresh water dolphins, while a crest is formed by the elevation of the maxillary bones in all the three groups. The difference is that in all the dolphins of the above series the base of the maxillary is extended laterally over the frontal, whereas the base of the maxillary in sperm whales is extended more behind for the purpose of aiding to form the spermacetic cavity. In all dolphins the nostrils approach to equality and symmetry, whereas in the family of sperm whales the nostrils are exceedingly unequal and unsymmetrical—and thus have a peculiar location in respect to the distorted and dislocated nasal bones. In the *Catodontidæ* also, the frontal bone is very conspicuous over the orbit, while in true dolphins it is comparatively covered by the lateral dilatation of the maxillary bones. Again a very remarkable distinction is this, that the toothed edges of the upper and under jaws in all dolphins are parallel, whereas in sperm whales the sides of the under jaw are linear and laterally compressed from where the symphysis takes place; and the tapering upper jaw is thus very much broader than the under.

Although such are perhaps the most valid characters by which sperm whales can be separated from marine dolphins, it is to be observed that if the *Catodontidæ* form a group of value equivalent to that of *Delphinidæ*, the sperm whales, and particularly the *Euphysetes*, can be only aberrant forms connecting the first-mentioned group with the dolphin family. It must be granted also on this hypothesis that the researches of naturalists have not as yet made us acquainted with the normal form of *Catodontidæ*, nor yet with those species of the group that pass off to the *Balænidæ* or family of right whales.

If I may be permitted to express my own opinion on a subject of considerable difficulty, and which certainly admits of much doubt—although the difficulty proceeds entirely from the paucity of species known,—I confess that I think the affinities of carnivorous *Cetacea* among themselves would be still better expressed by placing all the living species that are known in the two following groups: *Balœnidæ* and *Delphinidæ*. We may then make the sperm whales —animals, which, as we have shown, differ in no important particular from dolphins—fall into the series of *Delphinidæ*.

But in order to understand this matter more clearly, we had better consider the place which the order of *Cetacea* holds in the class of *Mammalia*. This order is distinguished neatly from all other mammals by the absence of hinder feet; and the typical *Cetacea* are evidently those, which, in other respects differ the most in structure from the other orders of *Mammalia*. Now, one of the characters most prevalent in these other orders is the possession of molar teeth implanted in the maxillaries. Incisors or intermaxillary teeth are often wanting, but, except in a few *Edentata*, which are destitute of all teeth, the maxillary bones are always provided with molars. Let us ask ourselves, then, what *Cetacea* are least oceanic in general structure, and, at the same time, in the possession of molars? The answer at once will be, the herbivorous group. The existing herbivorous *Cetacea*, together with the extinct genus *Zeuglodon*, and perhaps another fossil genus, form, without doubt, the aberrant group of the order, and are all distinguished by the possession of molar teeth with double roots, as distinct from their incisors. The remaining *Cetacea*, forming the normal group of the order, have no such molar teeth. These may be divided into 1st, true whales, *Balœnidæ*, or those *Cetacea* which have no teeth, but more or less baleen instead: and, 2ndly, dolphins, or *Delphinidæ*, which have only conical teeth with single roots, and more or less hollow, like those of crocodiles. Now, this last group, or the family *Delphinidæ*, may be divided into sub-families, as follows: the genus *Inia* of

D'Orbigny, serving to connect the *Platanistina* with the *Delphinina*.

A. Maxillary bones sub-horizontal and plane	DELPHININA.	Teeth in both jaws.
	MONOCEROTINA.	No teeth in under jaw.
B. Maxillary bones at their base rising vertically on their edge.	HYPEROODONTINA.	No teeth in upper jaw. Under jaw with short symphysis.
	CATODONTINA.	No teeth in upper jaw. Under jaw with long symphysis. Nostrils very unequal in size.
	PLATANISTINA.	Teeth in both jaws. Under jaw with long symphysis.

Of the many characters which I have before given as separating the sperm whale tribe from other dolphins, it is rather singular that Mr. Gray should not have noticed one. The definition given by him of his family of *Catodontidæ* or toothed whales, is as follows :—"Head large, upper jaw toothless, lower jaw with conical teeth fitting into cavities in the edge of upper jaw. Blowers united together by a lunate opening."

Now in the first place no sperm whales have cavities in the *edge* of upper jaw, while there are dolphins in possession of every one of Mr. Gray's other characters. The assertion of Mr. Bennet that rudiments of teeth are to be found in the upper jaw of young sperm whales, may be doubted; but Mr. Gray himself has stated that the genus *Physeter* or black-fish, which he makes to belong to the group, has the blowholes *separate*.* The least objectionable part of the above definition consists perhaps in the vague words "head large," and yet Mr. Gray assigns his genus *Kogia* to the family with the contrary character of "head moderate." No doubt the large size of the head in proportion to the body is a very striking characteristic of the genera *Catodon* and *Physeter*; but this is not particularly remarkable in *Euphysetes*, which has a head in external form very like to that of some dolphins, and not in proportion larger.

* Is this correct?

Premising that I am in Mr. Gray's and M. Cuvier's case of never having seen a black-fish or even any part of one, I shall now venture to offer my own definition of the group of *Catodontina* as more accurate than that given by my predecessors as the character of the

Family CATODONTIDÆ.

Upper surface of massive skull concave for the reception of spermaceti. Nostrils enormously disproportionate in size, the left one being the largest, and the nasal bones as well as those of the face generally, being thereby unsymmetrical and distorted. Blowhole externally single. (In all ?) Branches of the toothed lower jaw united in front by a long symphysis, which is always considerably narrower than the toothless upper jaw. Teeth of under jaw conical, hollow like those of a crocodile, and fitting into cavities formed in the gum of the upper jaw.

It has been more hastily conceded than truly said, that the age of large animals has passed away—that in those præ-Adamite eras of time which form the principal subject of geological study, the *vis creatrix* acted if not more complexly, at least on a larger scale than at present—that the *Megalosaurus*, for instance, was larger than the *Mastodon*, and the *Mastodon* again, larger than any animal production of our own degenerate time. Many enthusiastic admirers of the world's infancy, therefore, appear to have overlooked the actual existence of an order of mammals which, according to geological evidence appeared first on the face of our globe so lately as since the cretacean period. Yet this order now is apparently as numerous in species as in any previous æra, and contains in it the living great northern rorqual (*Balænoptera physalus* of Gray) an animal larger than any extinct geological species known, and probably the very "*Balæna Britannica*," which Juvenal fixed on as his standard of cetacean hugeness.

If our earth be trodden at present by no mammal so large as the *Mastodon* of North America, nor by any bird so huge as the *Deinornis* or moa of New Zealand, their disappearance is obviously so recent, that there is little difficulty in supposing that the extirpation of such species may be owing to the hand of man. Indeed the various species of the animal kingdom seem to be in danger of violent extinction in direct proportion to their size. The increase of this renders them in general less ferocious compared with other species. A porpoise, that is, the least of known *Cetacea*, is exceedingly voracious; but a sperm whale (whether *Catodon* or *Euphysetes*) which is nearly, as we have seen, the same as a porpoise in all the essentials of its structure, is rendered comparatively harmless by the want of teeth in the upper jaw. This deficiency perhaps was necessary to aid its bulky stores of spermaceti in balancing the specific gravity of its massive skull. Right whales are in like manner rendered mild and timid by an entire want of teeth, although the weight of of their skull is also relieved by the peculiar way in which the quantity of bone in it is reduced.* Thus it is that immense size is not ordinarily the characteristic of a beast of prey, and that the largest *Cetacea* feed only on minute *mollusca*. As for the immense size of *Cetacea*, it evidently proceeds from their buoyancy in the medium in which they live, and their being enabled thus to counteract the force of gravity.

Sperm whales are found to inhabit warmer seas than true whales, and are brought more within the reach of those persons whose love of destruction is attracted by their size and timidity, and whose love of money is excited by the value of their oil. Many whalers of late have declared that the number of young sperm calves annually killed is so great as to threaten the speedy annihilation of this kind of whale. With less motives for killing off the species, thus certainly within our own times has man wantonly extinguished the *Nestor pro-*

* It is for a similar reason that so many dolphins and other *Cetacea* have the branches of their under jaw hollow, while the symphysis is very short.

ductus of Phillip Island, and probably, at an earlier date, occasioned the similar fate of the singular Dodo.

But while we may regret the premature extinction of a harmless and useful species of animal by the destructiveness of another one, there can be no doubt that the Creator has imposed a natural limit to the duration of every species on the surface of this globe. Just as individuals are born into the world, live, and, after an appointed period, die; so we are taught by geology, that the time of the natural existence of every species is also limited. We observe the first appearance of a species of animal in one stratum, we view it flourishing, as it were, in another, then we trace it languishing, and its numbers rapidly decreasing in a later stratum, until, at last, it appears utterly extinct. We see other limited durations appointed for the existence of genera, families, and orders, so that analogy would make us infer that it must be the same—for all groups of which in geological strata we have, in a manner, witnessed the commencement. It thus may be that classes, nay, the two kingdoms of animal and vegetable nature themselves,—for these, after all, are but groups of greater dimensions—as they have had in geological strata a visible beginning, so must they also in process of time have their due end.

Nor need speculation cease here; since it would surely be the height of presumption to suppose that when all that organization of matter which is dependent for existence on atmospheric air, shall, with that gas, have passed away, other kinds of organic beings may not remain, where atmospheric air has never existed, or even where it may have ceased to exist. Nevertheless, it is true that there is no vestige of material life having ever existed on this terrestrial globe, except in connexion in some way with the atmosphere, and dependent on it. Nay, it would appear from observation, that the order of the creation of species—aye, and perhaps the order of their extinction too—has been carried on in point of time, with reference to the successive conditions of the circumambient air. Thus, aquatic beings have preceded

terrestrial. But there is an exception, which, as usual proves the rule; and, pursuing the consequences legitimately to be deduced from the above facts, we may, perhaps, be able to arrive at the true reason for marine animals, *warm-blooded*, like whales, having been called into existence so late, when their proper food, *Mollusca* and *Crustacea*, had, for ages before the earliest tertiary period, abounded in the waters which then covered a great part of the face of the earth.

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EXPLANATION OF PLATES.

PLATE I.—Fig. 1. Skeleton of *Catodon Australis* as set up.
Fig. 2. Six bones which compose the sternum of same.
Fig. 3. Os hyoides, where the dotted lines denote the cartilage that connects it with the styloidean processes.
Fig. 4. Bones of the pelvis, as found in the carcass of another sperm whale, cast up between Botany Bay and Port Hacking.

PLATE II.—Fig. 1. Skeleton of *Euphysetes Grayii*, as set up.
Fig. 2. Upper side of skull of same.
Fig. 3. Under side of skull of same.
Fig. 4. Occipital view of skull of same.
Fig. 5. Under jaw of same.
Fig. 6. Pelvis of same.

ERRATA.

Page 8, last line—For "*rocorded*" read *recorded*

Page 9, No. 11—For "*occipital foramen*" read *occipital bone.*